

BEFORE THE ARIZONA NAVIGABLE STREAM  
ADJUDICATION COMMISSION

3

In re: Determination of )  
Navigability of the Upper Salt ) No. 04-008-NAV  
River, Small and Minor ) No. 04-010-NAV  
Watercourses in Gila County, ) No. 04-014-NAV  
Small and Minor Watercourses in ) No. 03-007-NAV  
Maricopa County, the Gila River, ) No. 04-009-NAV  
and the Verde River. )  
\_\_\_\_\_ )

MEETING OF THE  
ARIZONA NAVIGABLE STREAM ADJUDICATION COMMISSION

Phoenix, Arizona  
November 17, 2005

(Copy)

Prepared by:  
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Certified Reporter  
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1 MEETING OF THE ARIZONA NAVIGABLE STREAM ADJUDICATION  
2 COMMISSION was taken on November 17, 2005, commencing at  
3 9:13 a.m., at the La Quinta Inn, 2510 West Greenway Road,  
4 Phoenix, Arizona, before Gerard T. Coash, a Certified  
5 Reporter in the State of Arizona.

6  
7 \* \* \*

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22 Mr. George Mehnert, Executive Director

23 Mr. Earl Eisenhower, Chairman

24 Ms. Dolly Echeverria, Vice-Chair

25 Mr. James Henness, Member

## 1 TRANSCRIPT OF PROCEEDINGS

2 CHAIRMAN EISENHOWER: Ladies and gentlemen,  
3 the time has come to reconvene the meeting of Arizona  
4 Navigable Stream Adjudication Commission. With that, I'm  
09:13:43 5 going to be, kind of, a benevolent dictator and change the  
6 order of business this morning. And the first order of  
7 business which I would like to accomplish is to gather  
8 evidence on the navigability or non-navigability of the  
9 small and minor water courses in Maricopa County. I  
09:14:06 10 intend to get rid of some of these smaller items so that  
11 we have the time later on to deal with the major items.  
12 So if the State and Mr. Fuller is ready to make his  
13 presentation.

14 For the record, we do have a quorum.  
09:14:38 15 Ms. Echeverria, Mr. Hennes, and myself, three of the five  
16 commissioners out of five, so we do have a quorum. We can  
17 conduct business.

18 Mr. Fuller, please.

19 MR. FULLER: Mr. Chairman and members of the  
09:14:48 20 commission. I'm prepared to talk to you today about the  
21 final report, Small and Minor Water Courses Analysis for  
22 Maricopa County. It was one of the county-wide analyses  
23 that was done. I believe this is the last for the county  
24 that we have to discuss. In Maricopa County, they  
15:04 25 identify 2495 watercourses. And of those, 2435 failed at

1 the level 1 stream process. Only four advanced from level  
2 2 to level 3, and that being Indian Bend Wash, Queen  
3 Creek, Seven Springs Wash, and one of the many Sycamore  
4 Creeks, a tributary to the Verde. And so those were  
09:15:29 5 analyzed at level three and none of those four were  
6 advanced for detailed analysis.

7 With that, I can answer any questions you  
8 might have.

9 CHAIRMAN EISENHOWER: Mr. Jennings, do you  
09:15:44 10 have any questions?

11 COMMISSION COUNSEL JENNINGS: Just the usual  
12 ones. The report that you made on this, did you find that  
13 the climatic and the weather conditions were the same or  
14 substantially the same when you made your report as they  
09:16:00 15 were in 1912?

16 A. I would say with respect to the streams that we  
17 looked at in Maricopa County, climate was not an impact,  
18 it was not a factor in whether they would or would not  
19 have been navigable. Climate was not a factor.

09:16:16 20 Q. So the climate would have been at least  
21 similar --

22 A. Yes.

23 Q. -- as of 1912 as it was when you did the report?

24 A. Yes.

16:25 25 COMMISSION COUNSEL JENNINGS: Thank you.



1                   CHAIRMAN EISENHOWER: Is there anybody in  
2 the audience that would like to ask Mr. Fuller any  
3 questions about the small and minor watercourses in  
4 Maricopa County?

09:16:40

5                   Hearing none, thank you very much,  
6 Mr. Fuller.

09:16:55

7                   Our next item of business is something for  
8 the commissioners to make a decision on, and that is that  
9 we must make a determination of the navigability of the  
10 small and miner watercourses in Coconino County. I will  
11 entertain a motion from one of my commissioners.

09:17:18

12                   MR. HENNESS: Mr. Chairman, I will be glad  
13 to made a motion that the determination of the  
14 navigability was non-navigable in Coconino County, and all  
15 the evidence that was presented, all that testimony that  
16 was given in evidence in regard to these items has led me  
17 to that decision. My motion is to declare those streams  
18 non-navigable.

09:17:27

19                   COMMISSIONER ECHEVERRIA: Second.

20                   CHAIRMAN EISENHOWER: I have a motion and a  
21 second, any discussion?

22                   Hearing none, I call for the vote.

23                   All those in favor?

24                   COMMISSIONER ECHEVERRIA: Aye.

17:32

25                   COMMISSIONER HENNESS: Aye.

1 CHAIRMAN EISENHOWER: Aye.

2 Opposed?

3 Hearing none, the Arizona Navigable Streams  
4 Adjudication hereby finds the small and minor watercourses  
09:17:43 5 in Coconino County are non-navigable.

6 I thank the audience for their patience in  
7 putting up with this, and we have taken care of that. And  
8 we'll resume our hearings on the Gila River. And I'm  
9 going to take some things out of -- a little bit out of  
09:18:07 10 order this morning. I would like -- because of certain  
11 mitigating factors, I would like to ask the Dr. Schumm to  
12 make his presentation at this time.

13 Be careful of those wires.

14 Anybody who comes to the podium, if you  
09:18:43 15 would speak up loud and clear for our court reporter so  
16 that we do have an accurate record.

17 DR. SCHUMM: I'm Stanley Schumm. Very  
18 hoarse today, as usual. I'm a fluvial geomorphologist;  
19 that's distinguished my type of geomorphology from that of  
09:19:05 20 a glacial geomorphologist or a coastal geomorphologist.

21 My background: I have a Ph.D. from Columbia  
22 University, worked for the geological survey for about  
23 12 years. And then I was at CSU for 35 years and  
24 presently Mussetter Engineering. I would like to read  
19:38 25 description of the Gila River that is in my report, and

1 this relates to work done by other geomorphologist experts  
2 in this region. So here I go.

3 "The Gila River is characterized by inherent  
4 stability and frequent and destructive channel  
09:22:09 5 migration ..."

6 (An off-the-record discussion ensued.)

7 DR. SCHUMM: I must say also that after  
8 hearing Dr. Huckleberry's report yesterday, I thought,  
9 "What have I got to say after that?" Because I concur  
09:22:21 10 with his comments.

11 But let me, again, read this description,  
12 and the description of the Gila River is by Anne Chin, who  
13 is a geomorphologist, and Will Graf, who worked extensively  
14 throughout the Southwest and was at Arizona State. Now he  
09:22:40 15 deserted us and went to, I think, North (sic) Carolina --  
16 University of North Carolina. So I'll start again.

17 "The Gila River is characterized by inherent  
18 instability and frequent and destructive channel  
19 migration, and there are reaches of relative stability and  
09:22:58 20 instability. For example, during the flood in 1941, the  
21 channel shifted" a half a mile "near Buckeye. According  
22 to Graf ... the lower Gila River 'typified braided  
23 streams,' " variable ... "'variable channel configuration  
24 and dimensions.' According to Ross," -- who is a  
23:26 25 geologist, a geological survey in early part the

1 century -- "the river in 1917 was a interrupted stream,  
2 that is, one that has local reaches of flow while most of  
3 the river was dry."

4                   And then coming to Dr. Huckleberry, he  
09:23:42 5 "summarizes the character of the Gila River as follows:  
6 'The Gila River is a classic example of a dryland river  
7 that seldom seeks an equilibrium form. Unlike rivers in  
8 humid regions that have more stable channels that are  
9 adjusted for more continuous streamflow with less variance  
09:24:02 10 in discharge, the dryland rivers are inherently more  
11 unstable and more prone to changes in channel  
12 configuration."

13                   I won't go on because this is exactly what a  
14 number of witnesses have said when they described the Gila  
09:24:17 15 River.

16                   You have seen this slide before when I  
17 testified earlier, and it's just my attempt to summarize  
18 the range of rivers that we have and that we see  
19 everywhere. And it's obvious that we're dealing with  
09:24:40 20 number five down here, the braided river. And as we go  
21 from the upper left to the lower right, up and down or  
22 across, we go from more stable channels in through here to  
23 more active meandering channels and finally to our braided  
24 channel, which is the Gila River. And so, and here is the  
25 various characteristics at the bottom, in terms of  
25:07

1 sediment flow and flow of velocity, et cetera. So we know  
2 what we're dealing with. We've seen these types of rivers  
3 and we understand how they behave through time.

4 Next slide. And of course, one of my  
09:25:26 5 favorite pictures, the Riney Taub, a wide-braided river on  
6 the south island of New Zealand. And it's clear there are  
7 multiple low-flow channels during a high flood. The water  
8 level was up on the bank. You might not know the river is  
9 braided because all the bars are covered by flowing water.

09:25:57 10 At the end of my presentation last time, I  
11 was asked if there are any braided rivers that were  
12 navigable, and I think that I said yes, the Brahmaputra  
13 and the Nile and so on, and here is the Nile. A big --  
14 actually a big island in the middle of the channel clearly  
09:26:21 15 indicating that under that water you're dealing with  
16 braided river.

17 Next please. And it's certainly navigable.  
18 The big tourist boat on the left and the faluka right and  
19 those falukas move up and down the river and back and  
09:26:38 20 forth, transporting all sorts of material, so it's clearly  
21 navigable.

22 Believe it or not, this is the Brahmaputra.  
23 You have the junction for the Ganges and way back off in  
24 the distance you can see a ship and they're probably at  
27:01 25 150 miles from the sea coast. So clearly, I know this is

1 braided and apparently is navigable. And what's common  
2 from all of these, there is plenty of water, and that's a  
3 key thing of the large braided river that is a navigable.  
4 This is our Mississippi River and it's a braided reach,  
09:27:26 5 probably because of a cutoff in the meander up here.  
6 Navigability is very important. You can see the tows --  
7 few tows in the middle of that river. It's anomalous to  
8 call them tows when they're pushers, but that seems to be  
9 the most efficient way moving products up and down the  
09:27:52 10 river.

11           If you can see this -- Let's go to next  
12 one. This is what we're dealing with. We're dealing with  
13 barges that are as long as a football field, and I think  
14 we have got about 5, 10, 15, 20, 25 of these, so clearly  
09:28:09 15 we're moving a tremendous amount of material up and down  
16 the river that in some places it's meandering, but right  
17 here it's braided.

18           One of the things we talked about is  
19 changing river characteristics. This is the Great Plains  
09:28:32 20 and it's in western Kansas. It's the Cimarron River in  
21 about 1890. You can see it's relatively narrow and deep  
22 and highly sinuous. Now this is the -- 1890.

23           In the 1930s there was a period of drought  
24 or the Dust Bowl but some very large floods moved through  
28:56 25 this valley. The average width of the river was about 70

1 or 80 feet there.

2 Here in about 1940, the entire valley floor  
3 was channeled, and the river was about a thousand feet  
4 wide.

09:29:17 5 Next one. All the bridges washed out also.  
6 Here, this is about 1980, the vegetation is coming in on  
7 the floodplain. All of these streams started to grow in  
8 about 1943, which is the end of the period of large  
9 floods. We went into a period of much smaller floods and  
09:29:39 10 more continuous flow. So here we have what I consider to  
11 be a metamorphosis, complete change in the river  
12 characteristics: narrow, deep, sinuous, wide, braided.  
13 And now it's becoming more sinuous and recovering its  
14 earlier pattern.

09:30:00 15 This is the South Platte east of Denver.  
16 That entire vegetated area from here over to here at the  
17 turn of the century was sand bed, braided river. You can  
18 see the width of the river now, so you're finding the  
19 Great Plains stream a major change from a wide-braided  
09:30:30 20 channel to a much smaller narrow-braided channel, not a  
21 complete change here because it's the same type of river,  
22 but we have gone from wide to narrow.

23 And this is the main Platte River in  
24 Nebraska, probably at least a half a mile wide. It's  
30:53 25 braided. And this is the North Platte. Again, you can

1 see how this bridge has disappeared -- sort of disappeared  
2 in the horizon. Now, at the present time, the river is  
3 much narrower, and the old bridge supports are turning  
4 from the new floodplain. So here we have got a situation  
5 on the Platte, the Arkansas. We started out with a very  
6 wide river and because of human activities, diversions,  
7 and so on, we now have a much narrower braided river.

8 Here is the Gila River today near Gila Bend.  
9 Clearly it's dry, but it's very, very wide and braided.

10 And the same location essentially looking downstream here.  
11 So in this particular area, we have the Gila River as it  
12 was probably in 1912, wide, braided, with a low-flow  
13 channel you can see down there.

14 And the next. As we go downstream,  
15 characteristics of the river change. Here it's defined  
16 between lava flows and so there's probably major geologic  
17 control here, and farther downstream, the river is  
18 channelized. It's difficult to see where the old channel  
19 actually was. And the next one.

20 This is near Wellton and probably -- this is  
21 very much like the Platte River. It's filled with  
22 vegetation and probably was the width of the Gila River  
23 channel in, say, 1912, and now it's narrowed considerably.  
24 It's a much narrower river, but it's still braided even  
25 though it's been reduced in width considerably through



1 time.

2 This is the Gila River near Calva, which is  
3 a considerable distance upstream. The top picture is  
4 1932, the bottom one is 1964. And again, this is what we  
09:33:49 5 have seen in that last slide. Here we have a very wide  
6 braided river with probably islands developing with  
7 vegetation, colonizing the islands. And now we have a  
8 much narrower braided river as a result of all the  
9 activity that you've heard of in the last day -- day or  
09:34:08 10 so. Next one.

11 Here is the result of Burken, and it's up in  
12 the -- I can't think of the name of the valley -- well  
13 upstream, and it shows that in 1905 to about 1930, even  
14 though he's describing the area in terms of acres -- area  
09:34:34 15 in acres, it shows a major change, major increase in width  
16 which we all know and we heard it described before. So  
17 it's a tremendous change in the channel of the Gila River  
18 through time, but again, it's a change from a wide-braided  
19 river to a narrow-braided river.

09:34:54 20 COMMISSION COUNSEL JENNINGS: Dr. Schumm,  
21 that is, you say, the upper valley, you're talking about  
22 the Safford Valley?

23 DR. SCHUMM: Safford Valley.

24 COMMISSION COUNSEL JENNINGS: The upper Gila  
35:02 25 Valley there?

1 DR. SCHUMM: Yes.

2 COMMISSION COUNSEL JENNINGS: Okay.

3 DR. SCHUMM: And here is Huckleberry's work.

4 Again, in the middle Gila, we see the same thing, the

09:35:19 5 dramatic increase -- in this case, channel width --

6 dramatic increase in channel width between 1905 to about

7 1930. Again, just documenting what we all know and what

8 we heard talked about before.

9 Here is the Gila in 1867 to 1915. This is

09:36:01 10 just downstream of the junction of the Salt and the Gila.

11 They are very similar with a relatively straight channel,

12 but the latter one is considerably wider, braided. The

13 map doesn't indicate braiding from the upper map, but

14 there's a large bar or island here and knowing the type of

09:36:29 15 sediment load that's in the channel, early -- the earlier

16 map of braided river. And here we have the braided river

17 in about 1915.

18 This is upstream from Buckeye. Again, the

19 river in 1880, the upper map, and 1970, the tremendous

09:36:57 20 increase that you can see. It might be hard to believe

21 but certainly that's a pattern that's characteristic of

22 sand, even though the surveyor shows a low-water channel.

23 It's clear we're dealing with a very wide range of area

24 that's approaching a mile in width, whereas earlier it was

37:19 25 just a fifth of a mile.

1                   Now here we are downstream. This is an  
2 error in my report in which I locate this township 8 south  
3 range 9 west -- actually it's 19 west. And this is the  
4 river in 1912. Again, showing a relatively wide-braided  
09:37:54 5 river. We don't have a copy of the map, but this  
6 indicates a braided river a considerable distance  
7 downstream.

8                   Finally, the aerial photographs in 1934  
9 showing the river about a mile wide from here up to here  
09:38:20 10 with a couple of low-flow channels. And again, typical  
11 braided river.

12                   And this is essentially the same area  
13 downstream from Buckeye with a more characteristic sandy  
14 bed and low-water channel.

09:38:41 15                   So that's what we're dealing with, a  
16 relatively narrow-braided channel in the early years,  
17 converting to a very wide-braided channel, indications of  
18 great instability.

19                   So really all I can say, in conclusion, is  
09:39:09 20 to agree with everything that Dr. Huckleberry and  
21 Dr. Fuller said about this river -- unstable in 1912, at  
22 the time of statehood, was a wide characteristically  
23 braided river. Thank you.

24                   MR. MCGINNIS: Sort of a housekeeping  
39:38 25 matter. We would like to submit Dr. Schumm's slides as

1 evidence. Do you have copies of them?

2 DR. SCHUMM: I can have them made.

3 MR. MCGINNIS: We can either give you the  
4 slides or -- I'm assuming you would prefer to have copies  
09:39:47 5 made.

6 CHAIRMAN EISENHOWER: Yes, that would be  
7 easier.

8 MR. MCGINNIS: We will send them to you.

9 CHAIRMAN EISENHOWER: Okay, thank you.

09:39:48 10 Appreciate that.

11 MR. HELM: We don't have copies of some of  
12 those slides. Is that correct?

13 MR. MCGINNIS: Well, they're right there.

14 (An off-the-record discussion ensued.)

09:41:05 15 CHAIRMAN EISENHOWER: You heard Dr. Schumm's  
16 presentation.

17 Laurie, would you like to ask a few  
18 questions?

19 MS. HACHTEL: Laurie Hachtel for the Arizona  
09:41:22 20 State Land Department and the Attorney General's Office.

21 Good morning, Dr. Schumm.

22 DR. SCHUMM: Good morning.

23 MS. HACHTEL: I didn't want to disappoint  
24 you, so I just have a few questions on your report, just  
41:31 25 to clarify a few things.

1 (Dr. Schumm is answering questions.)

2 BY MS. HACHTEL:

3 Q. First, Dr. Schumm, I noticed the title of your  
4 report is the "Geomorphic Character of the Lower Gila  
09:41:41 5 River." I was wondering if you could tell me exactly what  
6 reach of the Gila River are you opining to?

7 A. Well, when I wrote the report, I thought this  
8 hearing was just for the lower river from the junction of  
9 the Salt to the junction of the Colorado.

09:41:55 10 Q. So are you opining that the entire reach of the  
11 Gila River is non-navigable? Is that your opinion,  
12 Dr. Schumm?

13 A. My opinion is that the probability of navigation  
14 on this lower reach of the Colorado is very low.

09:42:20 15 Q. So --

16 A. Because the river is highly variable and for a  
17 short reach you might say, "Well, we can put a boat in  
18 here and go half a mile," but certainly not more than  
19 that, and that's what the historical documents seem to  
09:42:40 20 indicate.

21 Q. And you said that's in regards to the lower  
22 reach. Is that correct?

23 A. Well, that's the title of my report, but the data  
24 and information that I have from Huckleberry and Burkham  
42:58 25 show that the river was -- the entire river increased in

1 width during that time. So my assumption is it's wide,  
2 it's shallow, steep, braided river. And that type of  
3 river without the vast quantities of water in the Nile and  
4 the Brahmaputra, would likely be susceptible to  
5 navigation.

09:43:26 5  
6 Q. And that's for the -- again, just to clarify --  
7 for the entire river -- Gila River?

8 A. Until we -- now, I haven't seen the river  
9 upstream near the state boundary and it may be a different  
09:43:45 10 type of river. I know there's bedrock control the farther  
11 upstream you go in New Mexico, which is probably not  
12 relevant here, but it would be a very different type of  
13 bedrock in the channel.

14 Q. So again, just so I can -- I'm really trying to  
09:44:04 15 understand what you're opining to as far as the Gila. Is  
16 it the -- you said near the state border you haven't  
17 looked at it. I'm just trying to understand what part --  
18 or if it's the whole thing that you're saying is  
19 non-navigable? That's all I would like, Dr. Schumm.

09:44:24 20 A. I only have the information that I have taken  
21 from Huckleberry and Burkham. I've looked downstream at  
22 maps and aerial photographs and I flew the river through  
23 the junction of the Salt to the Colorado. So I only saw  
24 it from the air, and of course, that's in its present  
44:53 25 condition, which is in many cases very different from what

1 it was in 1912.

2 Q. So, Dr. Schumm, is it your opinion that the  
3 entire length of the Gila River through Arizona is  
4 non-navigable?

09:45:08 5 A. I would have to say yes, that's my conclusion.

6 Q. And Dr. Schumm, can you tell me, besides this  
7 report that you completed, what other studies or work have  
8 you done on the Gila River?

9 A. In the past, I can't recall that I did anything.

09:45:35 10 Q. And can you tell me what type of fieldwork you  
11 did in preparation for your report?

12 A. We just flew -- flew the river in a helicopter.  
13 Not on the ground at any of these locations, but I  
14 reviewed as much of the literature as I could acquire and  
09:46:11 15 looking at the available General Land Office maps and USGS  
16 topographic maps.

17 Q. Dr. Schumm, I would just like to explore a little  
18 bit in your report, a couple of sections.

19 I noticed in your presentation you had the  
09:46:32 20 slide of the Nile and so from what I gather, then, some  
21 braided rivers can be navigable, such as the Nile. And  
22 when you -- in your testimony, you said the difference  
23 between the Gila River and the Nile was that the Gila  
24 doesn't have the water that the Nile has. Is that  
46:53 25 correct?

1 A. That's true.

2 Q. And Dr. Schumm, can you tell me as far as how  
3 much water usually would make a braided river navigable in  
4 your opinion?

9:47:05 5 A. Depends on the river, the size of the river.

6 Q. Well, can you give me an idea as far as what --  
7 is there a certain type of boat that if it was on, for  
8 instance, a braided river that had enough water in it,  
9 that would be navigable in your opinion?

9:47:22 10 A. I'm sorry, I didn't follow that.

11 Q. Is there a certain type of boat that would make a  
12 difference as far as the amount of water in a particular  
13 braided river that you would say that particular river is  
14 navigable versus one that didn't have enough water, for  
9:47:36 15 instance, like the Gila River, that you're opining is  
16 non-navigable?

17 A. I can't tell you. The upper Mississippi is  
18 braided -- island braided, and the Corps of Engineers  
19 maintain a 9-foot depth there to carry the commerce up and  
9:47:53 20 down, so that's the only case that I'm aware of that I  
21 know what is needed, and it's 9 feet of water.

22 Q. So there's not such -- overall, you don't have an  
23 opinion as far as what -- how much water a river -- a  
24 braided river would need or what type of boat would need  
48:12 25 to be on it in order for it to be a braided river and be



1 navigable?

2 A. No.

3 Q. In your report, Dr. Schumm, you described the  
4 Gila as intermittent, right? It's on page 8 of your  
09:48:33 5 report. I just wondered if you could define for me what  
6 you mean by "intermittent"?

7 A. Well, I'm using the terminology of Ross in his  
8 1923 report. And basically what he's saying here is some  
9 reaches of the river where there's water -- flowing water  
09:48:49 10 and other reaches at the same time that -- where the river  
11 is dry.

12 Q. Do you know whether Ross determined that the  
13 river was intermittent because of -- that the low flow had  
14 been removed by diversions or other obstructions?

09:49:10 15 A. I don't believe he said anything about that.

16 Q. Or whether it was naturally intermittent?

17 A. I would guess that it's naturally intermittent.

18 Q. And do you know, what reaches of the Gila River  
19 does Ross's description apply to?

09:49:28 20 A. Somewhere down below Gila Bend.

21 Q. Okay. And then, Dr. Schumm, on page 12 of your  
22 report you conclude that the morphology of the river was  
23 not conducive to navigation. Can you define for me what  
24 you mean by "morphology"?

49:51 25 A. The characteristics of the channel. The width,

1 the depth, the pattern, distribution. If you're going in  
2 this great detail of distribution of bars in the channel.  
3 The position of the low-water channel.

09:50:11 4 Q. And did you develop a cross-section for the river  
5 that indicates a shape, width, or depth on -- in  
6 preparation for your report or today?

7 A. I made some measurements on maps and calculated  
8 or measured the width in some locations. I'm not sure  
9 that I used that information in my report.

09:50:36 10 Q. And what did you use to do those calculations?  
11 What did you rely upon, Dr. Schumm?

12 A. No, I didn't calculate anything. I just measured  
13 the width.

14 Q. Based on the maps that you referred to?

09:50:47 15 A. Yes.

16 Q. On the maps that you referred to, were they the  
17 1934 aerials? Is that you were referring to or is  
18 something else?

09:50:59 19 A. The aerials that I showed, yes, I measured the  
20 width there. And I then -- let's see, I think that I  
21 measured width on the USGS topographic maps the best I  
22 could; some places were very difficult to determine what  
23 the width was.

24 Q. And, then, specifically what you're referring to  
25 when you're doing those measurements, can you tell me what  
51:21

1 sections of the river those were for, what particular  
2 reaches that you did those on?

3 A. Well, those last two photographs were upstream of  
4 Gila Bend.

09:51:36 5 Q. And Dr. Schumm, is it your opinion that it's  
6 possible the river that experiences changes during floods  
7 can be navigated?

8 A. I'm sorry?

9 Q. That a river that experiences changes during a  
09:51:49 10 flood, is it your opinion that a river like that can be  
11 navigated?

12 A. Sure. I'm sure the Nile and the Brahmaputra have  
13 changed during floods.

14 Q. Dr. Schumm, on page 12, you conclude that the  
09:52:16 15 hydrology prevented navigation if the river were dry on  
16 the day of statehood, February 14, 1912. And my question  
17 is, what is the source of the hydrologic data on which  
18 base your opinion?

19 A. Just the U.S. Geological Survey that's referenced  
09:52:38 20 "USGS 1954."

21 Q. And did you consult any other data other than  
22 that -- the hydraulic records for the Dome gauge?

23 A. Well, I looked at -- I looked at -- let's see. I  
24 think I looked at the other gauging stations to see if the  
53:04 25 big floods were characteristic of as much of the river as

1 I was looking at.

2 Q. Did you look at any other measurements other than  
3 the Dome gauge as far as -- you said you looked at them  
4 for floods. Did you look any other -- use those  
09:53:20 5 measurements at all?

6 A. Just the mean annual discharge.

7 Q. For other gauging stations as well?

8 A. I think mainly the Dome gauge.

9 Q. And, Dr. Schumm, is it possible that the reason  
09:53:34 10 the river was dry at Dome is because of water storage and  
11 diversions?

12 A. Sure. Yes.

13 Q. Would you agree that irrigation diversions and  
14 dams are man-made structures and not natural features of a  
09:53:47 15 river?

16 A. Yes.

17 Q. And, Dr. Schumm, you said that you were looking  
18 at the median flow rates at the Dome gauge, can you tell  
19 me what the average annual or median flow rate is at the  
09:54:01 20 Dome gauge?

21 A. Not without the data. I don't have it with me.

22 MS. HACHTEL: I think that's it. Thank you,  
23 Dr. Schumm, no more questions.

24 (Dr. Schumm is answering questions.)

54:42 25 BY MS. HERR-CARDILLO:

1 Q. Good morning, Dr. Schumm. My name is Joy  
2 Herr-Cardillo. I'm with the Arizona Center for law in the  
3 public interest, and I represent Defenders of Wildlife,  
4 some individual citizens in this proceeding.

09:54:55

5 I'm not looking to retread, but I just want  
6 to clarify and follow up on some questions that Laurie  
7 asked you. It's my understanding that you personally only  
8 studied the lower Gila. Is that correct?

9 A. That's right, yes.

09:55:11

10 Q. And can you just clarify for the commission what,  
11 then, is the basis for your opinion with respect to the  
12 navigability of the Gila above Safford?

13 A. Oh, above Safford? I didn't consider that  
14 really.

09:55:29

15 Q. Okay. So you don't have an opinion as to the  
16 navigability of the Gila above Safford?

17 A. Well, my feeling is the river generally is  
18 braided, wide, shallow, and therefore, what I concluded  
19 from the downstream reaches would apply to the upstream  
20 reach -- reaches until one encounters bedrock somewhere.

09:55:45

21 Q. But you didn't actually study the upper reaches?

22 A. No. I just took the data from Huckleberry and  
23 Burkham.

24 Q. Okay. And when you talk about the data from  
25 Huckleberry, are you referring to his testimony before the

56:01

1 commission yesterday?

2 A. That and his geomorphology report.

3 Q. The report of -- what -- where would we find that  
4 report?

9:56:15 5 A. It seems to me it's in three of the navigability  
6 reports.

7 Q. Okay.

8 A. It's a chapter in some of the larger reports.

9 Q. In what was submitted by the State Land  
9:56:28 10 Department to this commission?

11 A. I don't remember whether it was State Lands --  
12 yes, I think that's right.

13 Q. John Fuller's report?

14 A. Yes.

9:56:39 15 Q. Okay. If I can ask you, in forming your opinion  
16 regarding the navigability of the Gila River, did you  
17 attempt to determine what the river would have been like  
18 in 1912 had there not been all of the diversions on the  
19 river?

9:57:02 20 A. No, I didn't.

21 MS. HERR-CADILLO: That's all I have.

22 CHAIRMAN EISENHOWER: I assume, Mr. Helm,  
23 you would like to ask a question?

24 MR. HELM: Absolutely. Could I just ask  
57:15 25 Jack, quickly, one question because I don't want to

1 misstate some of the testimony from yesterday. And I'm  
2 old and my memory is going quick.

3 CHAIRMAN EISENHOWER: Well, Dr. Schumm is  
4 the witness.

09:57:19 5 MR. HELM: I just want to make sure I'm not  
6 going to misstatement something when I ask Dr. Schumm a  
7 question.

8 CHAIRMAN EISENHOWER: Please hurry.

9 DR. SCHUMM: You're pretty peppy for an old  
09:57:43 10 man.

11 MR. HELM: I had that whiskey this morning.

12 DR. SCHUMM: I wish you had saved some.

13 MR. HELM: You should have called.

14 (Dr. Schumm is answering questions.)

09:57:48 15 BY MR. HELM:

16 Q. John Helm for Maricopa County.

17 You started off your testimony with some  
18 quotes from some other geomorphologists who have studied  
19 the Gila River. Do you recall that?

09:58:08 20 A. Yes.

21 Q. Okay. And I believe you mentioned Graf and Ross.

22 A. Yes.

23 Q. Do you know if any of the studies that Graf or  
24 Ross did, their studies encompassed the Gila River before  
58:25 25 there were any diversions or dams built?

1 A. My recollection is that in Graf's case, he was  
2 just describing very recent changes in the river channel.

3 Q. As he saw it when he went out and studied it?

4 A. Yes.

09:58:39 5 Q. Okay. And would that be the same for Ross?

6 A. Ross was an early geologist. I'm not sure what  
7 he did. He may have just made an observation as he  
8 traveled along the river and reported it in his papers.

09:59:04 9 Q. You talked about Ross mentioning intermittent  
10 flow in 1917 at -- was that Dome?

11 A. No. It was just a general statement as I recall.

12 Q. Would it be fair to say that the Gila River was  
13 totally diverted by 1917?

14 A. I don't know.

09:59:20 15 Q. You didn't do any study to determine how much of  
16 the Gila River had been diverted before statehood, dammed  
17 up, et cetera, et cetera?

18 A. No.

09:59:40 19 Q. Now, you also mentioned the work done by Mr. --  
20 or Dr. Huckleberry. You heard his testimony here  
21 yesterday, didn't you?

22 A. Yes.

23 Q. You heard his testimony that he did that study,  
24 the Gila River in its normal and natural or ordinary  
25 condition?



1 A. He studied the river as it exists.

2 Q. When he went out and studied it?

3 A. Yes.

4 Q. Now, is it fair to say the study that you

10:00:06 5 conducted didn't have any element of looking at the river  
6 in its natural and ordinary condition?

7 A. What do you mean by "natural and ordinary"?

8 Q. How it would have been before the westerners

9 moved west and started damming the river and diverting the  
10:00:37 10 flow to grow crops.

11 A. I didn't consider it.

12 Q. And so your conclusions on braiding and things  
13 like that and the river being in that condition are based  
14 on the river as you looked at it either in 1912 or after  
10:00:54 15 1912?

16 A. And in the General Land Office maps, which are  
17 considerably earlier, I think.

18 Q. Were you asked by your client to study the river  
19 and determine the effects that it would have had on its  
10:01:11 20 navigability if there had been any diversions?

21 A. No.

22 Q. Were you asked to look at it if there hadn't been  
23 any dams?

24 A. No.

01:26 25 Q. Okay. If you had, do you think -- Strike that.

1                   Would you agree that the channels would look  
2 different if there hadn't been any diversions or dams?

3           A.     Probably the dimensions would be different, but  
4 the pattern and with the gradient probably would remain  
10:01:52 5 the same.

6           Q.     When you're talking about dimensions you're  
7 talking about both depth and width?

8           A.     Yes.

9           Q.     Okay. When you were looking at it currently, did  
10:02:12 10 you happen to see the river when it was in what we  
11 euphemistically around here call flood stage?

12          A.     No.

13          Q.     So you don't know whether it was bank-to-bank  
14 full this winter even?

10:02:24 15          A.     No, I don't.

16          Q.     In the CFS that we had down there?

17                   Do you know how much CFS it would take to  
18 allow someone to canoe on a river?

19          A.     It would depend on the characteristic of the  
10:02:45 20 river.

21          Q.     In a shallow braided river?

22          A.     I don't know.

23          Q.     Would it be safe to say that you also don't know  
24 for most of the small craft that were used, let's say,  
- 03:04 25 during Colonial times?

1 A. Colonial times?

2 Q. Sure. The flat bottom boats, the canoes that the  
3 trappers used, those kinds of crafts?

4 A. It wouldn't need great depth, but it would depend  
10:03:26 5 on what you're transporting. If you're transporting  
6 goods, you need more clearance, more depth.

7 Q. What about transferring beaver pelts?

8 A. I have no idea what a beaver pelt weighs.

9 Q. Now, the condition of the Gila River today is a  
10:03:47 10 function of the amount of water it's had to flow down it,  
11 isn't it?

12 A. Probably, yes.

13 Q. I believe you talked -- I forget the river you  
14 talked about, but you talked about rivers that had become  
10:04:03 15 narrower over time?

16 A. Yes.

17 Q. Braided rivers that become narrow? Had those  
18 channels become deeper?

19 A. The -- what my conclusion was that the low-flow  
10:04:17 20 channel became the main channel, and the remainder of the  
21 channel became a new floodplain.

22 Q. And did that low-flow channel that became the  
23 main channel deepen to carry the water that used to be  
24 carried on the floodplain?

10:04:33 25 A. It was hard to tell, the ones I looked at. It

1 didn't have enough data on the cross-sections to be able  
2 to tell.

3 Q. And you didn't go out and do any studies yourself  
4 to determine whether they deepened?

0:04:46 5 A. Well, even if I had, I wouldn't be able to  
6 determine that.

7 Q. There is not historical data to determine that?

8 A. There might be someplace, but I have not found  
9 it.

0:04:59 10 Q. Can a braided river ever relative to meandering?

11 A. Only if the characteristic and sediment load  
12 changes.

13 Q. So your answer would be yes, it could relative to  
14 a meandering river if there are changes?

0:05:27 15 A. I'll say yes, but I can't give you any examples  
16 of that.

17 Q. Are you aware of any actual rivers where after  
18 mankind had used them for a number of years, somebody went  
19 in and tore out all the structures that man had put in  
20 those rivers and returned it to its natural state?

10:05:52 21 A. There are places where dams are being removed,  
22 but I can't tell you exactly right now where this is  
23 taking place.

24 Q. But even in those places -- I'm aware of some in  
06:09 25 California and in the Northwest -- they are not removing

1 all of mankind's impact on that river, are they?

2 A. Probably not.

3 Q. So if the standard to determine whether a river  
4 is navigable in its natural and ordinary state, as I  
10:06:31 5 define that, we don't have any actual rivers that you're  
6 aware of that we could go look at and say, "By golly, here  
7 is what happens to a river when we restore it to its  
8 natural state"?

9 A. No.

10:06:49 10 Q. Have you ever done any hypothetical studies on  
11 that in the flows that you ran up at Colorado State?

12 A. On the removal of dams?

13 Q. On returning a river to its natural state.

14 A. No.

10:07:01 15 Q. And if I understand your report and your  
16 testimony here, the change in the Gila River from the  
17 stable river that you found it to be in 19- -- 18 --  
18 before 1891, is because of the floods that occurred in  
19 1891, 1905, and 1906?

10:07:37 20 A. I don't think the river was ever stable. There  
21 was going to be changes in the channel, bank erosion.  
22 It's just characteristic of the river.

23 Q. That's characteristic of all alluvial rivers,  
24 isn't it?

07:51 25 A. Well, if we go back to my diagram, there's a

1 highly sinuous channel in the upper left. And we found  
2 that if the meanders are formed of high silt clay content,  
3 the channel is extremely stable, but as it becomes more  
4 sandy, the meanders become more active. So there's kind  
10:08:15 5 of two groups of meanders, stable meanders and active  
6 meanders.

7 Q. But the instability of alluvial rivers is known,  
8 isn't it?

9 A. Well, we can determine it from historical  
10:08:33 10 documents.

11 Q. The Mississippi is an alluvial river, isn't it?

12 A. It's surprising how much geologic control there  
13 is on the Mississippi.

14 Q. Do you know anything about the geologic control  
10:08:47 15 on the Gila?

16 A. No.

17 Q. Didn't do any study? You don't know what  
18 geologic controls exist on the Gila?

19 A. No.

10:08:57 20 Q. Mississippi moves around, doesn't it?

21 A. Well, it used to.

22 Q. Well, subject to the Corps of Engineers control  
23 of it?

24 A. Right. It was very active in fact.

9 09:11 25 Q. Now, if I also understand your testimony here,

1 you did no actual fieldwork on the Gila River in  
2 developing your opinions?

3 A. That's right.

4 Q. I just want to clarify one thing. I was trying  
0:09:28 5 the listen here. You talked about -- or I believe  
6 Ms. Hachtel or somebody asked you about surveying  
7 cross-sections?

8 A. Yes.

9 Q. You didn't go out there and survey any  
0:09:41 10 cross-sections on the Gila River to determine the depth of  
11 the channels?

12 A. No.

13 Q. As it exists today?

14 A. No.

0:09:47 15 Q. You didn't do it for -- or you didn't look at any  
16 surveys that had done that for other periods?

17 A. No.

18 Q. You're aware that they're in existence, though?

19 A. Yes.

0:09:57 20 Q. For example, you could go to the Maricopa County  
21 Highway Department and pick up a few, probably, couldn't  
22 you?

23 A. Probably.

24 Q. Might even get a couple from your client if you  
10:07 25 asked, right?

1 A. Certainly.

2 Q. Just to expand that question, kind of to dot the  
3 I, cross the T -- and you didn't do any surveys or make  
4 any attempt to make any determinations on what the depth  
10:10:26 5 -- I'm not sure how to describe this -- the main channel  
6 of a braided river where the thalweg is, the low-flow  
7 channel -- you get the picture I'm driving at -- that  
8 channel, even in a braided river, that will carry the most  
9 water to determine how deep that would be?

10:10:44 10 A. No.

11 Q. Is it also fair to say that in your study you  
12 never did any analysis about what the non-flood flows  
13 would be?

14 A. I looked at the mean annual discharge for the  
10:11:19 15 USGS water supply papers.

16 Q. At Dome?

17 A. Yes, at Dome.

18 Q. How about for the rest of the river?

19 A. I don't recall. I don't think so.

10:11:33 20 Q. Okay. And you certainly didn't do it for what it  
21 would have been in its natural condition?

22 A. No.

23 Q. You testified about your figure one.

24 A. Yes.

12:19 25 Q. Figure one, I believe, is in your report?



1 A. Yes.

2 Q. And you had it up on screen here and then you  
3 showed us a series of pictures of various rivers and the  
4 Gila River at various times and that sort of stuff. Have  
10:12:35 5 you done anywhere in your work any categorization of those  
6 pictures so that I could know which category on your chart  
7 they fell in?

8 A. At the bottom of that page, there's a  
9 classification of rivers based upon the sediment  
10:12:56 10 characteristics, and you could use that to locate yourself  
11 in the diagram.

12 Q. I understand. But what I'm saying is you  
13 haven't -- you showed the picture and you haven't said  
14 "that's a 3b" for that picture, which is all I -- I don't  
10:13:14 15 know what this means. So you have to bear with me on  
16 that.

17 A. Do you know what "3b" means?

18 Q. I don't know what 3b means or where it fits in  
19 the classification?

10:13:23 20 A. That's mine.

21 Q. Here's 3b.

22 A. I was thinking of someone else's 3b. It's  
23 actually just based on the pattern.

24 Q. So what you're saying, if I went back and looked  
? 13:46 25 at those photos again when Mark gives them to us, it would

1 be fair for myself or somebody like George Sabol to say,  
2 "Well, that picture is a photo" -- or "fits a 3b"?

3 A. Well, the trouble is that the photos I showed  
4 were number five, the braided channel.

10:14:09 5 Q. So in your opinion, all the photos you showed  
6 fall into the category that's illustrated in the figure --  
7 in Figure 1 were in the five category?

8 A. Right. The lower right hand corner.

9 Q. As I am looking at it, the lower right-hand  
10:14:41 10 corner?

11 A. Yes.

12 Q. You showed Figure 7, I believe. The --

13 A. Yes.

14 Q. What category would Figure 7 in the top -- top  
10:15:23 15 part fall into on your Figure 1?

16 A. I would say five.

17 Q. So you're saying this narrow channel thing is a  
18 five?

19 A. Well, it's narrower than the channel on the  
10:15:39 20 bottom, but you can still have braided streams of all  
21 dimensions.

22 Q. Have you ever seen that -- you never saw that in  
23 its actual condition?

24 A. You mean the 1869 one, no?

16:00 25 Q. Yeah.

1 A. No. I'm old, but I'm not that old.

2 EXECUTIVE DIRECTOR MEHNERT: But Mr. Helm  
3 was.

4 MR. HELM: I thought you might have grown up  
5 around there somewhere.

6 BY MR. HELM:

7 Q. And you would say that the lower half of that  
8 would be a five also?

9 A. Yes.

10 Q. And you would say that the Gila is a five?

11 A. Yes.

12 Q. And you would say, "I don't know what the Gila  
13 would have looked like" -- in terms of your figure -- "in  
14 its normal and natural or normal and ordinary condition"?

15 A. Well, I would speculate that it was braided, but  
16 I don't know the width -- what the width would be.

17 Q. Well, I guess where I'm going is, it would look  
18 significantly different than the pictures you showed us  
19 here earlier because, number one, it would have been a  
20 perennial flowing stream, correct?

21 A. I'm not certain about that.

22 Q. Before -- this is before we got here.

23 A. There are drought and dry periods.

24 Q. Absolutely can have a draught, but in its natural  
25 and ordinary, not meaning an unusual event like a draught

1 or a flood?

2 A. Well, it would be more water than there is at  
3 present, but I don't know what that amount of water would  
4 be.

10:17:47 5 Q. I take it that you would say that the river was a  
6 braided river before the 1891 flood?

7 A. Yes.

8 Q. And you described the river before the 1891 flood  
9 as "a relatively narrow and deep channel" river, in your  
10:18:06 10 report. Is that fair? In your Conclusions, number 1?

11 A. Some locations, that would be correct because  
12 people have described it that way.

13 Q. You don't -- but my point is, you don't tell us  
14 the locations where it's not that way, do you?

10:18:21 15 A. No.

16 Q. Okay. So what I have as your report here, that's  
17 what the report says, right?

18 A. Where are we in the report?

19 Q. Page 12, figure -- Conclusions, number 1.

10:18:46 20 A. Yes.

21 Q. Okay. Now, at least not all the diversions took  
22 place before 1891, although there were a whole bunch of  
23 them, so would that description be more representative of  
24 the river in a natural and ordinary condition without  
19:09 25 diversions?

1 A. Say that again.

2 Q. Sure. Your description in Figure 1 talks about  
3 the river before 1891, and all I'm asking, would that  
4 description that you used as the river before 1891, in  
10:19:25 5 number 1 of your Conclusions, be more typical of what that  
6 river would look like if we hadn't come around and built  
7 Roosevelt Dam and all of the other dams and done all the  
8 diversions that we did?

9 A. Well, in fact, below the dams there probably  
10:19:42 10 should be a deepening of the channel.

11 Q. What I'm driving at is for the whole lower Gila,  
12 not just at a location below the dam.

13 A. I don't know if this description applies to the  
14 entire Gila because the point -- I think the point that I  
10:20:02 15 am making is that it's highly variable and it changes its  
16 characteristics and we have seen that in dimensions.

17 Q. Does some of the variability come from the fact  
18 that there has been water diverted out of it?

19 A. I think the variability is related to fluctuating  
10:20:19 20 discharges peaking.

21 Q. And one fluctuation is no water, right?

22 A. Could be.

23 MR. HELM: Thank you, Dr. Schumm.

24 CHAIRMAN EISENHOWER: Is there anybody else  
? 20:52 25 that has any questions for Dr. Schumm?

1 MR. HESTAND: With the commission's  
2 permission. And I will be brief, I promise.

3 CHAIRMAN EISENHOWER: Thank you, sir.

4 MR. HESTAND: The greatest lie an attorney  
10:21:02 5 can ever say is, "I only have one more question."

6 Sir, thank you for being here today to help  
7 us.

8 CHAIRMAN EISENHOWER: Identify yourself.

9 MR. HESTAND: My name is John Hestand, here  
10:21:17 10 on behalf of the Gila River Indian community. I have some  
11 questions; perhaps you can help us kind of understand how  
12 the system works.

13 Now, you had your photograph of the river  
14 with sandbars and obstacles in it, and my question is, is  
10:21:38 15 the depth of the water or the amount of water in the river  
16 the only factor that would contribute to whether or not  
17 the river was navigable, or are there other factors that  
18 would also contribute, such as barriers in the river?

19 A. Barriers would be important, obviously. But in  
10:22:02 20 addition to the water flow and the flood events, the type  
21 of sediment load transported by the river is very  
22 important. And again, I haven't studied the geology  
23 associated with the Gila. But elsewhere, even on the  
24 Mississippi River, faulting -- faults that cross the river  
1 22:21 25 effected and uplift -- doming effected, so I don't know

1 whether that applies to the Gila.

2 Q. So as a general rule, though, if there are a  
3 number of sandbars or rock outcroppings or whatever,  
4 without regard to the flow, these would be obstacles to be  
10:22:43 5 dealt with?

6 A. Well, bedrock outcrop could change the gradient  
7 substantially.

8 Q. Now, you mentioned sediment. Am I correct in my  
9 understanding that if a river carries a great deal of  
10:22:59 10 sediment, that that could end up being a barrier to it  
11 being used for navigability?

12 A. Well, if it was transporting large amounts of  
13 sand and gravel, it would be a wide-braided river, so it  
14 would be much shallower than a river that's transporting  
10:23:15 15 primarily suspended sediment.

16 Q. Very good, sir. And lawyers like to play with  
17 dates, and we like to argue whether natural and ordinary  
18 means 1912 or natural and ordinary means 4387 B.C. And so  
19 I'd like to avoid that and deal with just some general  
10:23:42 20 concepts.

21 The Gila River, in the pre-Euro-American  
22 stage -- was the Gila River in the pre-Euro-American stage  
23 a flashy river?

24 A. I think that it would be because of the nature of  
25 climatic conditions.  
24:02

1 Q. So there were times of extremely low flow and  
2 then times of massive floods. Is that correct?

3 A. Yes.

4 Q. Okay. And am I correct that floods are not a  
10:24:17 5 man-made activity?

6 A. Correct.

7 Q. Okay. The flood is going to occur when God  
8 decides, not because a human being is irrigating or  
9 something. Is that correct?

10:24:31 10 A. Unless there has been a release from a dam, a  
11 reservoir, that would create a flood.

12 Q. Okay. And so whenever there is a flood, as I  
13 understand it, the flood tends to widen out the riverbed,  
14 flatten out the channels and create the braiding. Is that  
10:24:56 15 correct?

16 A. Well, the flood may be just modifying what is  
17 already there, and the braided river is there preflood.  
18 It would be there post-flood, but the configuration of the  
19 bed and the distribution of the bars would be changed.

10:25:15 20 Q. Okay. Now, am I given -- let's say that we had a  
21 regular release of water over a long period of time. I  
22 mean, a predictable steady release of -- and I won't give  
23 you a cubic feet per second because it could depend on how  
24 wide the area is -- but for a period of several years you  
25:49 25 had a predictable amount of water coming out in a



1 predictable pattern, would that tend to entrench and  
2 create a more predictable riverbed?

3 A. Again, it depends on the sediment in the bed. I  
4 believe the bed can armor and stabilize.

10:26:11 5 Q. Now, am I correct that dams oftentimes flatten  
6 out the instance of floods by holding them back and  
7 keeping high flow that would normally flow through held  
8 back so that it didn't flow through?

9 A. If that's the way that the flow is managed by the  
10:26:31 10 dam.

11 Q. Okay. So let's say we're talking about water  
12 storage dams, and let's say that a 25-year flood was  
13 coming through and the water storage dam could hold the  
14 25-year flood and that because there was a water storage  
10:26:48 15 dam, they chose to hold it, that meant that that 25-year  
16 flood wouldn't then go through. Is that correct?

17 A. Right.

18 Q. And so any widening of the channel, any braiding  
19 that that flood would have caused but for the dam would  
10:27:05 20 not then occur. Is that correct?

21 A. Yes.

22 Q. So in actuality, the creation of the dams, if  
23 anything, would increase the predictability of the flow  
24 rather than decreasing the amount of expansion and  
27:27 25 contraction that would happen in the absence of the dams.

1 Is that correct?

2 A. I didn't follow you, I'm sorry.

3 Q. Okay. And that's the problem when you have a  
4 lawyer trying to talk technical.

10:27:39 5 Without the dam, you're going to have water  
6 coming through at regular stages in large amounts,  
7 broadening out the area and either continuing rearranging  
8 the braiding or wiping out the established channel and  
9 creating new braiding. Is that correct?

10:27:59 10 A. Well, we wouldn't wipe out the channel.

11 Q. Modifying the channel?

12 A. The banks -- the banks might be unchanged, but  
13 the bed might be modified simply by the shifting of sand  
14 and sediment.

10:28:14 15 Q. Very good. And if we cut out a number of those  
16 floods, then we're cutting out a great deal of that  
17 rearrangement, aren't we?

18 A. It wouldn't occur as frequently.

19 Q. Okay. So in actuality, the creation of the dam  
10:28:30 20 would, in many ways, make the river more stable than it  
21 was before the dam's existence. Is that correct?

22 A. It could if the bed armors. But if the bed  
23 armors, then the banks are attacked, so it's difficult to  
24 say.

28:49 25 MR. HESTAND: Thank you, sir. This has been

1 very helpful. I appreciate it.

2 CHAIRMAN EISENHOWER: Does anybody else have  
3 any further questions?

4 Mr. Jennings, our counsel, has a couple if  
10:29:06 5 you don't mind, Dr. Schumm.

6 COMMISSION COUNSEL JENNINGS: Dr. Schumm,  
7 thank you again.

8 (Dr. Schumm is answering questions.)

9 BY COMMISSION COUNSEL JENNINGS:

10:29:10 10 Q. Would vegetation growing in the floodplain affect  
11 the characteristics of the river?

12 A. It could stabilize the banks of the river.

13 Q. And I was speaking there of natural vegetation  
14 that would grow up during the period in between the floods  
10:29:34 15 that might take it out.

16 A. You're wondering if this affects the floodplain?

17 Q. Yes. The characteristic of the river, either  
18 putting more island in, making it more braided, or less  
19 braided, or whatever.

10:29:55 20 A. Vegetation colonized the floodplain. It should  
21 -- the floodplain should normally have some vegetation  
22 before you drop down into the channel, so that vegetation  
23 could trap sediment and build up the floodplain higher  
24 than it is. And if the vegetation is growing nearer the  
30:21 25 banks, it could help stabilize the bank.

1 Q. Now, let me go one step further and ask you about  
2 man-introduced vegetation not native to the area, such as  
3 the Salt Cedar, the Tamarisk, as we call it, that was  
4 planted with great relish all up and down the Gila River;  
10:30:44 5 would that have affected the characteristics of the river?

6 A. I think so. It's a nasty bit of vegetation and  
7 it really stabilizes the -- if there is a period of low  
8 flow, it could move the channel and stabilize the channel.

9 Q. And then what would happen when -- after it's  
10:31:07 10 well-stabilized -- a major flood comes along?

11 A. It could remove that vegetation or the flood  
12 could be -- flood peak could be changed by flow through  
13 the vegetation.

14 Q. And could one of the results be that it would  
10:31:27 15 spread the floodplain because of the stabilization created  
16 by the Salt Cedar, the little islands, and so forth?

17 A. Yes.

18 Q. Now, you've been testifying as to navigability --  
19 well, let me ask you this, vegetation then affecting the  
10:31:50 20 characteristics of the river would certainly affect the  
21 navigability characteristics, would it not?

22 A. Probably, yes.

23 Q. Now, we've been talking about natural and  
24 ordinary and it seems everyone has a definition of that as  
32:13 25 to when did you, in your report, come up with a period of

1 time when the conditions you felt on the river were in  
2 their natural and ordinary condition?

3 A. I gave that no consideration because I didn't  
4 realize it was part of this activity.

10:32:36

5 Q. Well, you've been asked a lot of questions about  
6 the removal or diversion from the river, and the -- they  
7 were directed -- the questions were directed to the  
8 post-Colombian, post-European period of time. Did you  
9 consider any of the ancient civilizations that apparently,  
10 from the archeological reports, diverted major parts of  
11 the river, particularly down in the Casa Grande, Florence  
12 area, as long as 2000 years ago?

10:33:02

13 A. I didn't consider that.

14 Q. Okay.

10:33:18

15 A. I read the accounts of some of the explorers and  
16 trappers.

17 COMMISSION COUNSEL JENNINGS: I have no  
18 further questions.

19 CHAIRMAN EISENHOWER: Thank you.

10:33:36

20 Well, with that, thank you for your time,  
21 Dr. Schumm, your presentation, and thank the people who  
22 are involved here and good luck to you, sir.

23 And with that, we will continue on with our  
24 Gila River presentation, and I believe Dr. Littlefield is  
25 our next person in live to testify.

34:01

1 MR. MCGINNIS: I wonder if you would want to  
2 take a break for the court reporter, because we've been  
3 going an hour and half?

4 CHAIRMAN EISENHOWER: Sure. We will take  
10:34:15 5 about a 10-minute break and everybody get a drink and all  
6 that kind of thing.

7 (A recess ensued.)

8 CHAIRMAN EISENHOWER: It's time to go back  
9 into session again. First up on the agenda is

10:56:46 10 Dr. Littlefield, who would be testifying.

11 Mr. McGinnis, do you have any questions to  
12 lead off with?

13 MR. MCGINNIS: No, Dr. Littlefield did his  
14 direct yesterday. We're stuck with cross now.

10:57:05 15 CHAIRMAN EISENHOWER: That's fine if you  
16 have nothing further to add.

17 Is there anybody in the audience who wishes  
18 to ask questions of Dr. Littlefield?

19 Yes, I know you're here, Mr. Helm. Please  
10:57:16 20 come forward.

21 MR. HELM: I think we're the only ones that  
22 are left. I could be correct, but I think everybody else  
23 did their cross-examination yesterday, and I'm left to  
24 bloody the floor.

57:28 25 CHAIRMAN EISENHOWER: Okay. It's good

1 thing.

2 MR. HELM: As indicated yesterday,  
3 Ms. Livesay is going to take the doctor on his surveying  
4 work, because we had to kind of divide up the work because  
10:57:42 5 of the short notice on that thing. Then I'll go over the  
6 rest of the report when she's done.

7 MS. LIVESAY: Good morning, Dr. Littlefield,  
8 Mr. Chairman, members of the board. My name is Roberta  
9 Livesay, and I'm representing Maricopa County. And I'm  
10:57:56 10 going to try and make sure that my voice goes into the  
11 microphone. If anybody has any problems, please let me  
12 know.

13 CHAIRMAN EISENHOWER: The microphone is for  
14 our tape recorder, and you need to speak clearly for the  
10:58:12 15 court reporter. And also, when you ask a question, let  
16 Dr. Littlefield have time to answer so you don't start  
17 talking over one another. It just confuses the tape  
18 recorder.

19 MS. LIVESAY: I'll try to be aware of that.

10:58:26 20 CHAIRMAN EISENHOWER: Thank you very much.

21 (Dr. Littlefield is answering questions.)

22 BY MS. LIVESAY:

23 Q. Dr. Littlefield, I understand that you are a  
24 historian, you are not a licensed surveyor. Is that  
: 58:31 25 correct?

1 A. That's correct.

2 Q. And as far as I can tell from looking through the  
3 documents, you have no special training in practice of  
4 surveying. Is that also correct?

10:58:40 5 A. Other than having spent many years reviewing  
6 surveyors' documents and instructions and manuals, I have  
7 no other special training.

8 Q. And as far as your review of the survey documents  
9 and text, your conclusions that you set forth in your  
10:58:53 10 report are based on your interpretation of those

11 documents. Is that also a fair conclusion on my part?

12 A. I believe the documents speak for themselves for  
13 the most part.

14 Q. I assume, Dr. Littlefield, that you would accept  
10:59:08 15 other interpretations of survey practices, procedures,  
16 definition of terms, that kind of thing, if such were  
17 properly documented?

18 A. That's correct.

19 Q. Okay. So in that regard, Dr. Littlefield, would  
10:59:20 20 you -- I think you will agree with me -- you have reviewed  
21 this text, a "History of the Rectangular Survey System,"  
22 by White, rather extensively in preparation of your  
23 report?

24 A. That's correct.

59:37 25 Q. So you do consider this to be an authoritative



1 text with respect to surveys, correct?

2 A. Yes. And so is the Department of the Interior.

3 Q. And that's where I was going next.

4 The Department of the Interior also

10:59:53 5 publishes texts on surveying, correct?

6 A. That's correct.

7 Q. So I have with me today, for just availability  
8 sake, the Manual of Surveying Instructions, 1973, U.S.

9 Department of the Interior, Bureau of Land Management. To

11:00:08 10 the extent that this text is relevant to the time period

11 that you studied, you would accept the terminology and

12 definitions and explanations that are set forth in this

13 text as well, correct?

14 A. I don't see how that text could be relevant

11:00:23 15 unless it's reprinting documents from the time period that

16 I studied. It's a current document, and I don't know

17 anything about it.

18 Q. Okay. But if it does relate directly to that

19 time period, you would accept that as being helpful?

11:00:37 20 A. I would have to see what it says about it.

21 Q. Okay. And I assume you would also accept court

22 decisions, United States Supreme Court and other courts of

23 appellate jurisdiction, if they shed some light on the

24 terminology, practices, and procedures relating to surveys

00:59 25 -- U.S. government surveys?

1           A.    I only offered in my report and in my testimony  
2 what the surveyors were told by the land office to do, and  
3 also to the extent that the surveyors had documentation  
4 reflecting what they did. That's the only material that I  
11:01:14 5 dealt with. To the extent that courts have interpreted  
6 that material or to the extent that courts have directed  
7 the land department of surveyors to operate in certain  
8 means, I haven't reviewed any of that.

9           Q.    But you would accept those documents as  
11:01:29 10 authoritative in this field, wouldn't you doctor?

11           A.    I would have to see what they say. I'm not an  
12 attorney or judge, so I would have to see what they say.

13           Q.    Now you would agree, wouldn't you,  
14 Dr. Littlefield, that none of the government survey  
11:01:47 15 manuals used at the relevant time period to your study  
16 gave any definition or instructions to the surveyors as to  
17 how to determine navigability, correct?

18           A.    The terminology that was offered in most of the  
19 contracts and in the manuals was that they were to survey  
11:02:06 20 -- meander streams that were navigable. I believe the  
21 exact phrase was "under the statute." And what they meant  
22 by that, the 1796 statute, which I cited in my report,  
23 which was subsequently codified. Other than that, that's  
24 the only indication that I know of where they were  
11:02:23 25 provided with this precise definition of what to consider.

1 Q. Now, at the time your deposition was taken, you  
2 hadn't read that statute, correct?

3 A. I don't recall.

4 Q. Okay. Let me refer you to --

11:02:43 5 A. You're referring to my deposition from the  
6 Gillespie Dam matter?

7 Q. Yes.

8 A. Yeah, I don't recall.

9 Q. Let me read to you from page 73 of that

11:02:55 10 deposition. You are talking about the report.

11 "My report indicates that it was never  
12 presented specifically only to the extent  
13 that it said, 'which under law are navigable?'

14 The question: "And that was a specific  
11:03:13 15 reference to a statute, wasn't it?

16 "Answer: It was codified I believe, yes.

17 "Question: And that statute doesn't  
18 define it, does it?

19 "Answer: I don't know whether it does  
11:03:27 20 or not.

21 "Question: You didn't looked at that  
22 statute?

23 "Answer: No."

24 Does that refresh your memory?

25 A. If that's what the deposition says, that's what I

1 said.

2 Q. So is it your testimony today that you have gone  
3 back since that time and reviewed the statute?

4 A. I don't recall whether I have. I did ask to get  
11:03:50 5 the stat citation as opposed to the codification version,  
6 but I don't recall whether I read it or not.

7 Q. The statute doesn't contain any specific  
8 instructions or directions as to how to determine  
9 navigability, does it, Doctor?

11:04:08 10 A. I don't recall.

11 Q. You do agree that the determination of what was  
12 navigable was a discretionary decision of every individual  
13 surveyor doing the work?

14 A. That's correct.

11:04:33 15 Q. Now, again, at the time you had your deposition  
16 taken, you didn't have any specific understanding of what  
17 was meant by "natural arteries of internal communications"  
18 that's used in the survey instructions, correct?

19 A. No, I don't know what they meant by that.

11:05:02 20 Q. And you also would agree that your conclusion  
21 that surveyors determined that the Gila River was not  
22 navigable is your own interpretation of their work,  
23 correct?

24 A. No, that's not correct. What I'm reporting in my  
15:21 25 report and in my testimony was that all the surveyors who

1 were there elected to -- when they encountered the Gila,  
2 elected to treat the Gila in their surveys in a manner  
3 that was consistent within their view of what was a  
4 non-navigable body of water.

11:05:38 5 Q. But it is true, isn't it, Dr. Littlefield, that  
6 none of the surveyors make any statement that says  
7 specifically the Gila River is not navigable?

8 A. That's correct. They didn't need to. They were  
9 told exactly what to do if they thought it was navigable  
11:05:53 10 or if it wasn't, so they didn't need to use those precise  
11 words.

12 Q. And so it is your interpretation of the words  
13 that they did use that they were concluding that it was  
14 not navigable, correct?

11:06:04 15 A. Well, it's my interpretation of their  
16 instructions, as well as what they were paid, as well as  
17 what they did in terms of the surveys and setting out  
18 meanders or not setting out meanders. I think it's all  
19 pretty persuasive that they either were going to deal with  
11:06:19 20 a navigable body of water or weren't. I don't think they  
21 needed to use that precise word.

22 Q. And you agree that they did not use that precise  
23 language, correct?

24 A. To the best of my recollection, they did not use  
06:33 25 that exact word.

1 Q. Now, on page 12 of your report, you state that  
2 the Arizona survey began in approximately 1865 with the  
3 choosing of the initial baseline and meridian by John  
4 Clark. Is that correct?

11:07:04 5 A. If you give me a minute, I'll locate for you. Or  
6 if you could tell me approximately where on the page it  
7 is?

8 Q. I think it's up at the top of the page --

9 A. Yes, that's what my report says.

11:07:19 10 Q. And that's correct, to your knowledge?

11 A. If you look at the footnote citation at the end  
12 of that passage, it cites, C. Albert White, "A History of  
13 the Rectangular Survey System," that book that you brought  
14 and that I referred to; this is what Mr. White indicated  
11:07:31 15 in his book happened with regard to choosing the initial  
16 survey site.

17 Q. And you don't have any other information that  
18 would indicate that that's not a correct statement?

19 A. I think Mr. White's book is fairly comprehensive.  
11:07:48 20 If it's incorrect, then I would be willing to be shown  
21 documents to the contrary.

22 Q. Now, the Arizona survey began in approximately  
23 1865, according to White's book. But in your report, you  
24 chose to use the Oregon field manual as the starting point  
1 28:08 25 for your discussion of the Gila River survey work,

1 correct?

2 A. The Oregon field manual was the manual that came  
3 into use in 1851 and was the manual that governed how all  
4 surveys after 1851 were done in the west until new manuals  
11:08:26 5 were issued. It was called the Oregon field manual  
6 because at the time, in the late 1840s, that's where most  
7 of the overland immigrants were going, either Oregon or  
8 California. So when the manual was published, it was  
9 entitled -- or its title was reflecting where most  
11:08:43 10 settlement was taking place, but it was the manual that  
11 was in effect at the time of the surveys that were started  
12 in Arizona.

13 Q. And I believe my question, Dr. Littlefield, was,  
14 you chose to use the Oregon field manual as the starting  
11:08:58 15 point for your analysis. Is that correct?

16 A. That's the first manual that was in use.  
17 Correct.

18 Q. Okay. Good. Now, I have also gone over this  
19 book, in the short time that I've had, and I didn't see  
11:09:12 20 anything in there that said that the Oregon field manual  
21 was supposed to be used for all surveying that was done  
22 from that point on. It's limited to Oregon from what I  
23 can read. Can you point me to anything in that survey  
24 that says it's to be used elsewhere?

09:30 25 A. Well, I think if you had gone through the survey

1 contracts that are available at the National Archives, you  
2 would find that the survey contracts of the early  
3 surveyors said, in their directions to the surveyors, "You  
4 will follow the published instructions that are of the  
11:09:45 5 land office that are currently in effect." And given  
6 Mr. White's authoritative study of the surveys that were  
7 done, that was the manual that was in effect. So I don't  
8 think it's too much of a leap of faith to say the  
9 surveyors in Arizona used the manual that was in effect  
11:10:02 10 because that's what they were told to do. They used the  
11 Oregon manual because there was no other one at the  
12 particular time.

13 Q. Well, our survey started in 1865. We established  
14 that. Isn't there also instructions to the surveys  
11:10:19 15 general of public land of the United States for those  
16 surveying districts established since the year 1850 that  
17 was published in 1855?

18 A. There was the 1855 manual. There was also the  
19 1864 manual. Both of those made very few changes to the  
11:10:39 20 original Oregon manual. I have noted the changes that are  
21 relevant with regard to bodies of water in my report. I  
22 think I've covered that very thoroughly. If you would  
23 like, I would be glad to point out the precise changes  
24 that occurred from manual to manual.

11:00 25 Q. I think it's just fine for this purpose. Now,



1 Dr. Littlefield -- and we'll go through, and if you have  
2 any quarrel with my citations to the 1865 or 1864 manual,  
3 you can raise them at that time.

4 A. I would be glad to.

11:11:09 5 Q. Now, on page 13 of your report at -- towards the  
6 bottom, again, you're referring to the instructions to the  
7 surveyor general of Oregon. But you begin a discussion  
8 about an instruction that the White text refers to as  
9 "insuperable objects on line - witness points," do you see  
11:11:36 10 that?

11 A. You're on page 13?

12 Q. Yes, at the bottom. You see the sentence that  
13 starts "First, the instructions provided that when  
14 surveyors encountered 'impassable objects'?"

11:11:52 15 A. Yes. You said "insuperable." But I see the  
16 passage that says the word "impassable."

17 Q. Okay. But that's from a section in the White  
18 text that's headed "Insuperable" -- "Insuperable Objects  
19 on Line - Witness Points" -- that's the heading of that  
11:12:14 20 section in the text, isn't it?

21 A. I don't recall what's the heading. You would  
22 have to go back to the White volume to correct that. The  
23 footnote for that particular paragraph indicates that it  
24 came directly -- for the quote at least -- came directly  
12:27 25 out of the instructions to the Surveyor General of Oregon

1 as reprinted in White's book.

2 Q. Okay. We have provided the commission -- and we  
3 have some extra copies as well -- of some excerpted  
4 passages from the White text. And is there a copy up  
11:12:44 5 there for the witness?

6 MR. HELM: I don't know.

7 BY MS. LIVESAY:

8 Q. Well, let me have you go ahead and use the text,  
9 then, for this question. You can turn to page 461,  
11:13:00 10 Dr. Littlefield?

11 A. I'm sorry, which page?

12 Q. 461.

13 A. Yes, I have that page.

14 Q. Okay. And you'll see the heading there,  
11:13:21 15 bracketed number 5, "Insuperable Objects on Line - Witness  
16 Points."

17 A. Yes, I see that.

18 Q. Now, this is from the 1855 instructions, but  
19 you'll see the same language, I believe, as you quote on  
11:13:37 20 the bottom of page 13 of your report. In the text there,  
21 under Insuperable Objects on Line, it talks about under  
22 circumstances where your course is obstructed by  
23 "impassable obstacles, such as ponds, swamps, marshes,  
24 lakes, rivers, creeks, and et cetera." Do you see that in  
13:59 25 the text as well as in your report?

1 A. Yes, I see that.

2 Q. Okay. So that was the same, basically, as what's  
3 in the Oregon instructions, correct?

4 A. Yes.

11:14:19

5 Q. All right. So what the instructions are  
6 basically telling the surveyor to do is that if he  
7 encountered an impassable obstacle, which includes rivers,  
8 he was to prolong his line across the obstacle by taking  
9 right angle offsets or using other survey techniques?

11:14:38

10 A. Well, that's only part of it. If you look at  
11 page 14 --

12 Q. I'm getting there, Dr. Littlefield, so if you  
13 would just stay with me. Question --

14 A. I would like to answer your question, if I may?

11:14:46

15 Q. Well, the question right now is, I just want to  
16 establish this first part. And we will get through it, I  
17 promise you. We will go farther, but as far as this first  
18 part is concerned, that's basically what the instruction  
19 is, isn't it?

11:15:00

20 A. Yes, that's correct.

21 Q. Okay, thank you.

22 Now, if the impassable obstacle occurred at  
23 the intersection of lines, the surveyor was to establish a  
24 witness point, sometimes called a witness post or witness  
25 corner; is that also included in that part of the

15:15

1 instruction?

2 A. Yes, that's correct.

3 Q. Now, witness points, post, or corners can also be  
4 used to establish a meander or meander corner, can't they?

11:15:29 5 A. Yes.

6 Q. All right. You then -- in your report, you  
7 continue on to discuss meander corner posts. And again,  
8 to your knowledge, Dr. Littlefield, the 1855 and 1864  
9 instructions, with regard to meander corner posts, are  
11:15:50 10 essentially the same as they are in Oregon survey that you  
11 looked at?

12 A. I believe so.

13 Q. Now, again, sticking with page 461 of the text,  
14 on the right-hand side of the column, the second paragraph  
11:16:11 15 under meander corner posts states the following: "The  
16 courses and distances on meandered navigable streams  
17 govern the calculations wherefrom are ascertained the true  
18 areas of the tract of lands (section, quarter section, et  
19 cetera) known to the law as fractional and binding on such  
11:16:37 20 streams." Do you see that?

21 A. Yes, I do.

22 Q. So if a surveyor calculated the true areas of a  
23 fractional tract of land on a meandered stream, that  
24 calculation was binding and this would indicate a  
16:51 25 navigable stream, correct?

1 A. I don't know to the extent that it was binding.  
2 You don't indicate binding on whom. But that's the  
3 instruction that they were given as it is reprinted from  
4 the instructions.

11:17:10 5 Q. Now, would you agree with me, Dr. Littlefield,  
6 that the purpose of meandering was to ascertain the  
7 quantity of land in the fractional section that would be  
8 subject to sale?

9 A. That was one of the purposes.

11:17:22 10 Q. Page 22 of your report, you talk about the 1902  
11 instructions.

12 A. I think you must be operating from my earlier  
13 draft of the report. My page 22 doesn't have that, of the  
14 current report. Are you using the current report?

11:17:58 15 Q. I certainly thought I was.

16 A. I can tell you what's on my page 22.

17 Q. Does it have a heading "B. Summary and  
18 Conclusions Regarding" --

19 A. Yes, it does.

11:18:07 20 Q. Okay. And you see the line that is second to the  
21 bottom of that paragraph, it starts, "In addition, as the  
22 1902 instructions illustrated, surveyors also used the  
23 term 'meander' (frequently incorrectly) to identify  
24 irregular survey lines along reservation boundaries"?

18:34 25 A. Yes, I see that.

1 Q. There isn't any indication anywhere that  
2 surveyors use the term meander incorrectly with respect to  
3 rivers, is there?

4 A. Not in the historical documents that I have seen.

11:18:54 5 Q. I'll take the book back from you.

6 Surveyors weren't vested with power to make  
7 legal determination of navigability, were they,  
8 Dr. Littlefield?

9 A. I don't believe they were.

11:19:29 10 Q. I would like to skip ahead to the section  
11 starting on page 30 of your report. And I hope we've got  
12 the same page here. The top of the page should be a  
13 capital letter D, "U.S. Government Surveys Along the Gila  
14 River"?

11:19:47 15 A. Yes, I see that.

16 Q. Okay. Now the first areas that you discuss with  
17 respect to the surveys are township 1 north and range 1  
18 west; township 1 north and range 2 west; and township 1  
19 south and range 2 west, correct?

11:20:08 20 A. I will take your word for it. I don't remember  
21 exactly which ones I discussed in my report. As I  
22 indicated in my direct testimony, I examined every  
23 township and none of the material in that in any of the  
24 surveys conflicted with the material that I did discuss in  
25 my report.

20:24

1 Q. Okay. Now the survey for township 1 north and  
2 range 1 west, there the surveyor set a number of witness  
3 corners, correct?

4 A. Could you point me to where I say that in my  
11:20:41 5 report.

6 Q. You don't.

7 A. I don't remember it precisely without looking at  
8 it exactly.

9 Q. I'm sorry, this is first time I've appeared  
11:20:52 10 before the commission. I'm not sure where the exhibits  
11 are. Do we have the surveys up there?

12 MR. HELM: There's six of them.

13 BY MS. LIVESAY:

14 Q. Dr. Littlefield, we're going to get a copy of the  
11:21:39 15 survey folders that we prepared for the commission up  
16 there for you so you can follow along. The first one I  
17 need the witness to look at is township 1 north, range 1  
18 west, it should be the very first folder on the top. And  
19 can you find in there a copy of the plat map,  
11:22:09 20 Dr. Littlefield?

21 A. I'm sorry?

22 Q. Can you find in there a copy of the plat map?

23 A. This is the one that's identified as officially  
24 filed on 12-2-1870.

25 MR. MCGINNIS: Excuse me, just for  
22:35

1 housekeeping, those have evidence numbers just for the  
2 transcripts so we can keep it -- know what we're talking  
3 about, because I'm not sure, once we get the transcript,  
4 we'll know what documents we're talking about.

11:22:45 5 EXECUTIVE DIRECTOR MEHNERT: They don't yet.  
6 We just received them yesterday.

7 MR. MCGINNIS: Okay.

8 EXECUTIVE DIRECTOR MEHNERT: And what is  
9 their title? What's the correct title for them, for those  
11:22:55 10 folders?

11 MS. LIVESAY: These are the surveyor's notes  
12 and plat maps that are for the stretch of the Gila River  
13 from -- starting 1867 and going forward.

14 DR. LITTLEFIELD: I think, just for the  
11:23:10 15 commission's information, we need to be a little bit more  
16 precise than that because the -- some of these townships  
17 were surveyed multiple times, and there can be a lot of  
18 confusion if we don't know exactly which plat we're  
19 talking about or which set of field notes we're talking  
11:23:27 20 about.

21 MS. LIVESAY: And we'll be clear as we go  
22 along. These are all organized by file folder and every  
23 file folder has a label on it showing the township and  
24 range number.

1 23:38 25 MR. MCGINNIS: Okay.



1 MS. LIVESAY: As we go through the documents  
2 that are in the file folders, we'll be very careful to  
3 identify them so the record will be clear.

4 BY MS. LIVESAY:

11:23:49 5 Q. So what we're looking now is the plat map  
6 officially filed 12-12-1870?

7 A. Yes, I see that.

8 Q. And I understood from your discussion on direct,  
9 Dr. Littlefield, that one of the things that you would  
11:24:00 10 look for to see if, in your opinion, a particular surveyor  
11 thought that the river was navigable, would be an array of  
12 data on the right-hand side of the plat map that would  
13 show meanders. Is that fair?

14 A. That's true. Some of the -- in most cases, some  
11:24:22 15 of the township plats that I have seen -- I don't recall  
16 if it's on this river or one of the other Arizona ones or  
17 in California or Idaho where I've done a lot of similar  
18 work -- in some cases the surveyors weren't 100 percent  
19 consistent. They were more consistent about putting their  
11:24:37 20 meander data into their field notes than they were about  
21 putting them on the plat. But as a general rule, you're  
22 correct.

23 Q. Okay. And this particular plat map that we're  
24 looking at for township 1 north, range 1 west, 1870, does  
24:53 25 not have a place on the right-hand margin for such meander

1 notes. Is that right?

2 A. That's correct.

3 Q. Now, if you go to the field notes, there should  
4 be an excerpt from book 1666, that's three pages stapled  
11:25:19 5 together.

6 A. Yes, I have that.

7 Q. And if we're on same piece of documentation, the  
8 second page in that group of three should look like this,  
9 have book 1666 and up in the corner is a handwritten  
11:25:40 10 number 7?

11 A. Yes, that's the surveyor's page numbering.

12 Q. Okay. And you see there, at indication 80.00  
13 towards the bottom of page, do you see the writing there?

14 A. Yes.

11:25:56 15 Q. And do you see there where the surveyor is saying  
16 that he set witness corner?

17 A. Yes.

18 Q. This surveyor was also interested in looking at  
19 fractional sections, and he frequently made reference to  
11:26:28 20 fractional sections, correct?

21 A. I don't recall.

22 Q. There should be another set of field notes in  
23 that folder. That's book one.

24 A. Yes, I see that.

27:07 25 Q. And do you see at the bottom of the first page

1 there, of the excerpt -- it's page 375 -- that the  
2 surveyor set a post. And again, he's talking about  
3 fractional sections. Very bottom, 71.80.

4 A. Yes.

11:27:30 5 Q. And I'm going to page 387 in that same group of  
6 notes. Are you with me?

7 A. Yes, I have page 387.

8 Q. At the bottom there is a section 24.00, I  
9 believe, though it's a little difficult for me to read.

11:27:57 10 In any event, the last paragraph of notes on that page, it  
11 says "set a post," and again, we're talking about  
12 fractional sections?

13 A. Yes. It's not section 2400, that's a reference  
14 to the number of chains from the beginning of the survey  
11:28:11 15 line. Yes. And he does say set a -- yes, he says setting  
16 a post.

17 Q. At fractional sections?

18 A. Correct.

19 Q. And again on page 398?

11:28:33 20 A. Would you like me to refer to a particular part  
21 of that?

22 Q. Right in the middle there, on the left-hand side,  
23 the very middle set of notes: "To right bank of Gila  
24 River, high banks, sandy bed." Then he talks about "set a  
25 post to fractional sections"?

1 A. Yes.

2 Q. Okay. Again on page 408, the middle there. The  
3 last full paragraph on the bottom of the left-hand column,  
4 "Set at post at this point for corner to fractional  
11:29:16 5 sections"?

6 A. Yes, I see that.

7 Q. The next page is page 409. Again, right in the  
8 middle of the page, "Set a post at this point for corner  
9 to fractional sections"?

11:29:36 10 A. Yes, I see that.

11 Q. And then page 423, very bottom. These are under  
12 the General Description heading.

13 A. I'm sorry, which page number?

14 Q. Page 423.

11:30:06 15 A. Yes, I see that.

16 Q. The very last statement at the bottom of that  
17 page, "It is a fine stream"?

18 A. Yes, I believe I quoted that in my report.

19 Q. Okay. It continues on to the next page.

11:30:31 20 Now, do you have there -- the next folder  
21 show be township 1 north, 2 west.

22 A. I have the folder.

23 Q. In this section, the surveyor makes comments that  
24 the water is 18 inches deep. Do you recall that?

? 30:52 25 A. You would have to point me to a specific section.

1 I went through an awful lot of surveyor's notes, and  
2 without a specific reference, I can't recall.

3 Q. That's fine.

4 A. If you prefer, you could cite me to a page in my  
11:31:13 5 report, if that's of any help.

6 Q. I would like to get it out of here if I have it  
7 marked properly.

8 Let's go to field notes book 1633. There  
9 should be a page in there. A single page.

11:31:50 10 A. Yes, I see book 1633. It appears to be labeled  
11 in the upper left-hand corner page 151. Is that correct?

12 Q. Page -- in the upper left-hand corner?

13 A. Yes.

14 Q. Yes, that's -- that's what it looks like. I'm  
11:32:02 15 not sure that's what it is. Up in the upper right-hand  
16 corner, it looks like a 7.

17 A. Correct. I think we have the same page.

18 Q. Okay. And this isn't exactly the reference I was  
19 looking for, but do you see there at chain 29.42, "Left  
11:32:21 20 bank of Gila River, low bank, deep water"?

21 A. Yes, I see that.

22 Q. Okay. Now, one of the questions I'm going to be  
23 asking you at the end, Dr. Littlefield -- and I just want  
24 to give you a preview as we're going through these  
? 32:52 25 folders -- tell me, if you can, from your recollection all

1 of the plat maps show both right and left bank lines for  
2 the section of the Gila River that goes through the map  
3 that's in these folders, correct?

4 A. I believe that's correct.

11:33:18 5 Q. Okay. Just one quick question from folder  
6 township 1 south, range 2 west.

7 A. Yes, I have the folder.

8 Q. Field notes book 1166.

9 A. Yeah, there are several pages to that. Do you  
11:33:53 10 have one in mind?

11 Q. Yes. Page marked 97 in the upper right-hand  
12 corner. Should be the third page in.

13 A. I see that.

14 Q. Okay. Do you see the note at the bottom of that  
11:34:07 15 page, "There is plenty of water in the Gila River for  
16 irrigation"?

17 A. Yes. That's what it says.

18 Q. The next section that you look at in your report  
19 is township 4 south, range 4 west, correct?

11:35:18 20 A. I'll take your word for it.

21 Q. But before I get to that specific section of your  
22 report, Dr. Littlefield, there are some things that I  
23 would like you to look at in some of the other folders.  
24 Would you turn to township 1 south, 3 west?

11:35:39 25 A. Yes, I have the folder.

1 Q. Do you recall going through the field notes  
2 related to this section?

3 A. Not specifically. I assume that I did. I went  
4 through them all.

11:35:50 5 Q. Okay. You've got field notebook 1167?

6 A. Yes.

7 Q. It starts with an index diagram on the first  
8 page?

9 A. Yes.

11:36:02 10 Q. Okay. Go to the second page. This is a fairly  
11 detailed set of notes, isn't it, Doctor?

12 A. These are approximately the same type of notes  
13 that they all were.

14 Q. Do you see there the indication that chain 21.60,  
11:36:26 15 "right bank deep water"?

16 A. Yes. "Right bank, deep water, low banks."

17 Q. The next page. I can't quite make out which  
18 chain it is, but it's right in the middle of the page. It  
19 looks like .30?

11:36:51 20 A. You're correct. That's .30.

21 Q. It says, left bank of Gila River has  
22 south .80 degrees west, flow banks and deep water measure  
23 across.

24 A. Yes. I believe it actually reads "Left bank of  
25 Gila River flows south 80 degrees west, low bank and deep  
37:08

1 water measure across."

2 Q. Okay. Is it fair to say, from just reviewing  
3 this, without taking the time to go through each and every  
4 indication of the notes, that this surveyor was able to go  
11:37:33 5 to both the right and left banks of this section of the  
6 river?

7 A. I'm not sure exactly what you're asking.

8 Q. Well, the indications are, from the field notes,  
9 that he goes to the left bank then the right bank, and  
11:37:51 10 then he goes back to the left bank and back to the right  
11 bank.

12 A. They were told to do that in their instructions,  
13 where they crossed the river on line, they were to measure  
14 across it and using triangulation or other surveyors'  
11:38:01 15 techniques and they did, in fact, do that. They placed  
16 witness posts on each bank and for bodies of water that  
17 were navigable, those were the beginning points for  
18 meanders. But yes, they did mark both banks of the river  
19 when they crossed them. I might add, that was true for  
11:38:26 20 rivers that were both meandered as well as not meandered.

21 Q. And in fact, if you just turn to -- in that same  
22 section, book 1167, to page -- seems to be number 97 in  
23 the upper right-hand corner. It should be the second one  
24 from the back -- no, excuse me, the very last page in the  
38:48 25 set.



1 A. The top line of the text reads "and raised amount  
2 of earth"?

3 Q. Yes.

4 A. Yes, I have that.

11:39:02

5 Q. And then if you go down to 9.00, left bank of  
6 Gila River -- and I am having a hard time reading exactly  
7 what the next word says there -- then we have a  
8 measurement, and then W corner, witness corner, bank  
9 measure across.

11:39:21

10 A. Yes. I have spent a lot of time deciphering the  
11 handwriting. The word you can't read there is "course."  
12 So it actually reads "9.00, chains, left bank of Gila  
13 River, course south 31 degree west, low bank measure  
14 across."

11:39:37

15 Q. Okay. Again, from the township 1 south, range 4  
16 west.

17 A. I have the folder.

18 Q. Field notes book -- field notebook 1632.

11:40:18

19 A. Yes. There are two selections, apparently, from  
20 that book. Do you have one in particular in mind?

21 Q. I think that actually we might have some double  
22 copying going on, but the one that I would like you to  
23 turn to is, I think, 19 up in the upper right-hand corner.  
24 Although, again, it's pretty hard to read.

11:40:39

25 A. The top line reads "North BET. Secs 13 and 18"?

1 Q. That's correct. Would you read what it says at  
2 3.12?

3 A. 3.12, that would be "Chains, left bank of Gila  
4 River" -- I can't make out what the next part is, but it's  
11:41:08 5 something east and west -- "low banks and deep water  
6 measure across."

7 Q. I'm going to go ahead now with township 2 south,  
8 range 5 west.

9 A. I have the folder.

11:41:48 10 Q. Book 1635 of the field notes, there's a single  
11 page there in your stack with 50 in the upper right-hand  
12 corner.

13 A. Yes, I think I have the page you're referring to.

14 Q. Would you read what it says for 23.00?

11:42:10 15 A. "23.00, left bank of Gila River and set a meander  
16 post in" something, "and pit as per instructions."

17 Q. Could that be "in the mound and pit"?

18 A. Could be, yeah.

19 Q. And would you read what it says for 65.00?

11:42:35 20 A. "The right bank of Gila River, 20 feet high and  
21 set a meander post in mound and pit as per instructions."

22 Q. And go to book 1161.

23 A. Yes, I see that.

24 Q. There's no chain indication there, but would you  
11:42:58 25 read that first paragraph?

1 A. "Meanders of the left bank of Gila River through  
2 the township beginning at the meandering post on the south  
3 boundary between sections 35 and 2 and following the  
4 meanders of the left bank of the said Gila River going  
11:43:19 5 upstream."

6 Q. Okay. And then read the paragraph that starts  
7 "North 40 -- 3 -- 40, 3/4 degrees west."

8 A. "45, chains to the meander corner between  
9 sections 26 and 35, thence in section 26."

11:43:45 10 Q. And continue reading.

11 A. "North 76 degrees, west 8.5, chains" -- I believe  
12 it would be -- "to the meander corner, sections 26 and 27,  
13 thence in section 27."

14 Q. And there should be a page 143 of book 1161.

11:44:07 15 A. Yes, I have that page.

16 Q. Would you read the text portion -- the first text  
17 portion there?

18 A. Beginning with what?

19 Q. I think that's "North 1 degree." I can't really  
11:44:21 20 tell.

21 A. "North 1 degree, east 13, chains to a willow tree  
22 marked for meander corner." -- I believe it's "on the  
23 quarter section line in section 27," and then I can't read  
24 what the next word is.

11:44:42 25 Q. In book 1161, another single page, I think it's

1 137, but it's very faint, in the upper left-hand corner.

2 A. I'm sorry, what was the page number again?

3 Q. I think it's 137. It's very faint.

4 A. In which book?

11:45:18 5 Q. 1161.

6 A. And the page number is on the right or the left  
7 side?

8 Q. It's on the left, but --

9 If I could come up there, maybe I could just

11:45:55 10 show you what I have got?

11 A. Sure.

12 I can use your copy if you would like.

13 Q. Okay. Dr. Littlefield, I've handed you my copy  
14 just for convenience. Would you read the section where I  
11:46:14 15 have that little piece highlighted?

16 A. "47.5, chains, right bank of Gila runs  
17 southeast" -- or "courses southeast," I'm not sure  
18 which -- "and set a meander post in a mound and pits as  
19 per instructions, no trees," I think it reads.

11:46:35 20 Q. Okay. Now I'm going to be referring you to book  
21 1161, page 138. The copy is a little clearer on this one  
22 so hopefully it's there and you can find it.

23 A. I don't seem to have that page in here.

24 Q. Well, we'll just do the same thing.

17:47:16 25 A. Okay.

1 Q. There are two highlighted sections there; would  
2 you read them both, please?

3 A. The top one reads "As per instructions, on the  
4 left bank, 2 chains north from corner point, which is also  
11:47:33 5 a meander corner between sections 26 and 27. Bank bluff  
6 and 20 feet high" -- I think it reads "no trees near." I  
7 think that's a reference that they were to mark with a  
8 glaze on the tree where they were putting out those posts.

9 And the other highlighted one lower on the  
11:47:54 10 page reads, "8.20, the left bank the Gila River run  
11 southeast and set a meander post." And then it goes on to  
12 the next chain reading.

13 Q. And look at the next page where the -- the page  
14 number is pretty indecipherable on that one, but if you  
11:48:22 15 can identify it by the indications made by the surveyor  
16 and read the highlighted portion, please?

17 A. It says it's from book 1161, township 2 south,  
18 range 5 west. And the top line, just for identification,  
19 says, "Chains, Gila and Salt River meridian at the corner  
11:48:43 20 to sections 25, 26, 35, and 36." And the passage that you  
21 have highlighted reads "71.8, chains, left bank of the  
22 Gila River, 20 feet high and set a meander post in mound  
23 and pit as per instructions, no trees near."

24 Q. And what I've just handed you, I think, is marked  
49:16 25 page 140. And again, would you read the highlighted

1 portion?

2 A. "2.0, chains that meander and witness corner on  
3 left bank of river."

4 Q. And this one -- the next page I've handed you  
11:49:54 5 again does not seem to have a page on it. It's also from  
6 book 1161. And would you just agree that there's a  
7 section there where it talks about a meander corner that's  
8 highlighted?

9 A. Yes. The passage reads, "48.30, a willow tree  
11:50:14 10 10 inches" -- I believe it's "diameter" -- "on the left  
11 bank of the Gila River and" -- something -- something "for  
12 a meander corner as per instructions. Gila River about 4  
13 chains wide here and deep water and" -- something about a  
14 bluff. I can't make it out. "There's a steep mountain  
11:50:48 15 and no other section lines in this township that" --  
16 something or other, it's too faint to read.

17 Q. And lastly, I handed you pages 59 and 60 from the  
18 same book. Would you read the references there that are  
19 highlighted?

11:51:12 20 A. "78.84, chains, right bank of the Gila River, low  
21 banks," something "south, 10 degrees east, set witness  
22 corner at this point, corner falling into river."

23 Q. And there's another one on the next page.

24 A. Next page doesn't identify -- maybe it's a  
51:37 25 continuation of the previous page. I'm not sure.

1 "Set a post 4 feet long, 4 inches square  
2 with marked stone, 12 inches in the ground for witness  
3 corner to sections 27, 28, 33, and 34 marked."

4 Q. Okay. And I would like to direct your attention,  
11:52:08 5 next, to another section of the survey that is not  
6 referenced in your report, it's township 3 south, range 4  
7 west. And I take it, Dr. Littlefield, that you would have  
8 reviewed these field notes as part of your analysis that  
9 you present to the commission, correct?

11:52:39 10 A. I did. I reviewed them all.

11 Q. Okay. So if you look inside that folder, please.  
12 The first thing I would like you to look at is the page of  
13 field notes that's handwritten and has been blown up for  
14 easy reading.

11:53:04 15 A. Yes, I see the enlarged page.

16 Q. Okay. Would you read the note for 5.00?

17 A. "Intersect the right bank of the Gila River, run  
18 southeast, bluff, bank 20 feet high, and set a meander  
19 post in the mound and pit as per instructions, no trees  
11:53:37 20 near."

21 Q. And the next note on that same page, 40.60?

22 A. "Left bank of Gila River runs southeast, a  
23 cottonwood 6 inches diameter and near" something "for  
24 witness, 1 quarter section corner, also for meander  
54:03 25 corner, bank sloping."

1 Q. In that same folder, book 1635, page 35, up in  
2 the upper left-hand corner.

3 A. Yes, I have that.

4 Q. Okay. Would you read what it says there for  
11:54:34 5 5.00?

6 A. "Intersect the right bank of the Gila River run  
7 southeast, bluff, bank 20 feet high, and set a meander  
8 poles in a mound and pit as per instructions, no trees  
9 near."

11:54:50 10 Q. Book 1161, page 124 is another set of field  
11 notes. Still in township 3 south, range 4 west.

12 A. I'm sorry, what page number?

13 Q. 124. It should be the first page of that set of  
14 field notes?

11:55:09 15 A. "3.60, chains, set a meander post on the right  
16 bank of Gila River in a mound and pits as per  
17 instructions, no trees near."

18 Q. And would you read the next one as well, please?

19 A. "35.10, the left bank of Gila River and marked a  
11:55:30 20 cottonwood tree, 10 inches diameter, for a meander corner  
21 as per instructions, no other trees."

22 Q. The next page is page 129 in that set.

23 A. Yes, I have that.

24 Q. Would you read the whole narrative on that page,  
25 please?  
55:50



1 A. "Meanders of the left bank of the Gila River  
2 through the township beginning at the meander post on the  
3 west boundary of section number 7 and going downstream  
4 following the meanders of the left and east bank of said  
11:56:07 5 river in section 7."

6 Q. And continue, please. The whole page.

7 A. "South 33 degrees east, 24.00 chains. South 47  
8 and 3/4 degrees east, 30.00 chains to the meander post  
9 between sections 7 and 18, thence in section 18. South  
11:56:35 10 15 degrees, east 26 chains. South 2 degrees, east 30  
11 chains. South 1 -- or 12 and 3/4 degrees east. 26.00  
12 chains to the section -- to the meander corner between  
13 sections 18 and 19."

14 Q. And the next page is 130 and if you just continue  
11:56:59 15 reading that page as well.

16 A. "Thence in section 19 south, 17 degrees east. 20  
17 chains, south 38 degrees east. 15 chains, south  
18 20 degrees east. 21 chains, south 27 and a half degrees  
19 east. 17 chains to the meander corner between sections 19  
11:57:31 20 and 20 thence in section 20."

21 Keep going?

22 Q. Keep going.

23 A. "South 27 and 3/4 degrees east, 16 chains to the  
24 meander corner between sections 20 and 29. Thence in  
11:57:41 25 section 29, south 22 degrees, east 20 chains. South 18

1 chains, south 20 degrees, east 15 chains. South 29.30,  
2 chains to meander corner between sections 29 and 32."

3 Q. And the next page is 131. The narrative  
4 continues. If you'd read the first -- the top part of  
11:58:10 5 that page where it continues from the previous?

6 A. That's in Section 32, "South 10 degrees west, 20  
7 chains" -- or 25, I'm not sure which. "South 18 degrees  
8 east, 35 chains. South 2 and 3/4 degrees east, 21 chains  
9 to the meander corner on the south boundary of section  
11:58:32 10 number" -- it appears to be 32 -- "April 25th, 1871."

11 Q. And then if you just look at the very last  
12 sentence on that page, and I will read it, Dr.

13 Littlefield. Mr. Foreman, the surveyor says, "The Gila  
14 River flows to the southwest corner of the township and  
11:58:54 15 has lively current." Did I read that correctly?

16 A. Yes, you did.

17 Q. There's no language in anything that you have  
18 read from these field notes in this section that would  
19 indicate an explicit opinion on the part of Mr. Foreman  
11:59:08 20 that the river is not navigable, correct?

21 A. I haven't seen the rest of the notes, but in the  
22 selections you've offered me, no, there is not.

23 Q. Let's go to page 38 of your report.

24 A. Yes, I have that.

? 59:42 25 Q. I'm going to send you back, real quick, to

1 page 34. I just saw something that I wanted to ask you.

2 Again, do you see the discussion of 1907  
3 Interior Resurvey of Township 1 North, Range 2 West?

4 A. Yes.

12:00:07 5 Q. And you made a note there that on the plat, the  
6 Buckeye Canal is shown?

7 A. Apparently I did, yes.

8 Q. Do you know how much water the Buckeye Canal  
9 would have diverted from the river?

12:00:39 10 A. I have no idea.

11 Q. Now if you go to page 38. This is where you  
12 discuss the 1871 interior survey of township 4 south,  
13 range 4 west. Is that correct?

14 A. That's correct.

12:01:04 15 Q. Now, one of the first things that I noticed is  
16 that you said that the lack -- in second paragraph -- "The  
17 lack of meander data for the Gila River in this township  
18 is one indication that Gila River was not navigable." Do  
19 you see that?

12:01:22 20 A. Yes, I do.

21 Q. Would the presence of meander data indicate that  
22 it was navigable?

23 A. It's one of the possible explanations depending  
24 on which manual the surveyor was using.

01:41 25 Q. Now, let's take a look at the folder for township

1 4 south, range 4 west.

2 The plat map here was officially filed  
3 June 23rd, 1871. Do you see that?

4 A. Yes.

12:02:10 5 Q. And this is one of those plat maps where there is  
6 no place for meander data to be set forth on the  
7 right-hand margin, correct?

8 A. Correct.

9 Q. Okay. Now, if we look at the field notes here,  
12:02:27 10 first one I would like to you look at is -- oops. Excuse  
11 me. It's noted as book 1161. And I believe that's 41,  
12 but I can't make that out real well, but it looks like  
13 this.

14 A. Yes, I think that I have that.

12:02:55 15 Q. Okay. Would you look at the bottom of that page,  
16 at 3.00, would you read what that says?

17 A. "26.00, right bank of river and set a meander  
18 post in mound and pit as per instructions."

19 Q. And what I think you just read was from page 43  
12:03:27 20 because that's 26.00.

21 A. Okay.

22 Q. And that's exactly what that does say. Do you  
23 have a page that looks like it's page 41?

24 A. What's the chains at the top -- in the top.

03:40 25 Q. The chains at the top -- again, it's a little

1 difficult to read, but it looks like 48.00?

2 A. Yes, I have that page.

3 Q. Okay. Would you read what it says at the bottom  
4 there for chain 3.00?

12:03:55 5 A. "3.00, left bank of Gila River, set a meander  
6 post in mound and pit as per instructions."

7 Q. And there should be a page that's marked page 60,  
8 and it only has a little bit or narrative on there. I  
9 would like you to read what that says.

12:04:18 10 A. "Meander corner on the south boundary of section  
11 32."

12 Q. Thank you.

13 Now, there is page in there, a grid, it  
14 looks like this. And it's indexed for township 3 south,  
12:04:41 15 range 4 west, on page 63.

16 Are you with me?

17 A. I think I have it.

18 Q. Okay. That has a lot of information set forth by  
19 the surveyor, correct?

12:05:11 20 A. Yes.

21 Q. And at the bottom of that grid of information, it  
22 says "meanders of Gila River pages" 8 through 60 -- "58  
23 through 60." I'm sorry.

24 A. I'm not sure that I'm looking at the same page  
? 05:33 25 you are, then.

1 Q. Let me bring it over to you.

2 A. Okay. Maybe I'm looking at a different one.

3 Yes, it says that.

4 Q. Okay. And what you are looking at is where the  
12:05:41 5 surveyor has diagramed those meanders, correct?

6 A. I don't think so, not on this page.

7 Q. But in any event, we do have historical records  
8 showing meander data for township 4 south, range 4 west?

9 A. Yeah. I would like to clarify something here.

12:06:06 10 There were surveyors that misidentified the posts that  
11 they were putting on the edges of streams. They  
12 occasionally interchanged using the words "meander post"  
13 as well as "witness post," and that was not uncommon.  
14 I've seen that in quite a few places. So to the extent  
12:06:25 15 that there are meander post on the side of the river here,  
16 I'm not particularly bothered by it. I think one needs to  
17 look at the overall package of all the surveys along the  
18 river.

19 Q. And you don't have any information, as you stand  
12:06:37 20 here today, do you, Dr. Littlefield, that would refute  
21 that what the surveyor was doing was actually setting  
22 meander posts, do you?

23 A. He said he was setting meander posts, that's what  
24 he said he was putting there.

12:06:47 25 Q. And you have nothing to refute that, correct?

1 A. That's what he says.

2 I think -- just to help out there, I think  
3 the reason why some of these later volumes were issued was  
4 simply to clarify the use of the term "meander." And if  
12:07:15 5 you'll note, the Solomon Foreman survey was done in 1871,  
6 which is one of the earlier surveys, so I'm not surprised  
7 that there is some confusion over whether they're setting  
8 meander posts or witness posts.

9 Q. And that confusion would be your interpretation,  
12:07:32 10 correct?

11 A. That would be my interpretation.

12 Q. Now, I need you to take a look at township 4  
13 south, range 6 west, Dr. Littlefield, because this one is  
14 not mentioned at all in your report.

12:07:54 15 A. Yes, I have the folder.

16 Q. First thing I would like you to look at is the  
17 plat map.

18 A. There are two of them here. Do you have a  
19 particular one you would like --

12:08:18 20 Q. I'd like you to look at the one that's officially  
21 filed July 12, 1882.

22 A. Yes, I see that.

23 Q. And do you see the layout of all the meanders of  
24 Gila River on the right-hand side of that plat map?

12:08:32 25 A. Yes, I do. It's also identified under where the

1 surveyors are who did the meander surveys.

2 Q. And this, in your testimony, is an indication  
3 that the surveyor thought that this river was navigable,  
4 correct?

12:08:48 5 A. No. As I indicated, beginning in -- I believe it  
6 was the 1881 manual, as well as in the 1890 manual, there  
7 was circumstances under which both banks of the river  
8 would be meandered, that were for bodies of water that  
9 were not navigable. The 1881 manual provided for bodies  
12:09:07 10 of water that were over three chains wide that were not  
11 navigable to be meandered. The 18- -- I believe it was  
12 the 1890 manual added to that even bodies of water that  
13 were less than three chains wide could be meandered if they  
14 weren't useful for -- if the properties -- parcels along  
12:09:25 15 the edge couldn't include the body of water for useful  
16 homesteading purposes.

17 Q. And if a surveyor was going to do that, you would  
18 expect to see it fully documented in his notes that that's  
19 the reason that he was meandering, correct?

12:09:39 20 A. I have never seen any of the notes -- well, let  
21 me put it this way. I have see a few of the notes where  
22 they had precisely said why they did the meanders. Most  
23 of the time they don't set out why they did the meanders.  
24 Just in one or two circumstances they were precise about  
12:09:54 25 why they were doing it. In most cases they just indicated



1 where they signed off in the -- that they did it as per  
2 their instructions.

3 Q. So it's simply your personal opinion that these  
4 sections were meandered pursuant to some purpose other  
12:10:15 5 than an indication of navigability, correct?

6 A. I think when you look at cumulatively all of the  
7 surveys up and down the river -- and if you'd like to go  
8 through them all individually, I would happy to with you  
9 and explain them all.

12:10:29 10 They accumulatively indicate that the  
11 purposes for which the meanders were done, in most  
12 circumstances, were for reasons that don't relate to  
13 navigability under one of the instructions, either the  
14 1864 instructions, which said one bank for non-navigable  
12:10:46 15 bodies of water that were for internal communication; 1881  
16 and 1890, that said either three chains or less than three  
17 chains depending on what the nature of the body of water  
18 was like, and of course, if they thought it was navigable.

19 Q. I would be happy to do that with you,  
12:11:02 20 Dr. Littlefield. And I have gone through every folder  
21 that I could get my hands on, and I can tell you that I  
22 don't see any place in any of those folders where there's  
23 an indication that the meandering was done for some other  
24 purpose other than to indicate navigability. If you can  
11:19 25 point me to some explicit language that offers that

1 explanation, that would be very helpful.

2 MR. SPARKS: Mr. Chairman, I realize that  
3 this is not a formal hearing and that you're not using the  
4 formal rules of evidence, but that entire monologue was  
12:11:40 5 testimony and this is cross-examination, and there wasn't  
6 a question in it. And so if the attorney could be  
7 directed to ask questions, so that the witness could  
8 answer, I think we could get along a little faster here.

9 MS. LIVESAY: I actually think that was a  
12:11:54 10 question, sir. I asked Dr. Littlefield to point me to  
11 some place in file folders where that explicit language  
12 was used.

13 DR. LITTLEFIELD: Explicit language  
14 regarding what?

12:12:05 15 BY MS. LIVESAY:

16 Q. The reason for the meandering that would indicate  
17 some purpose other than the surveyor's opinion that the  
18 river was navigable.

19 A. As I just indicated a moment ago, it was rare for  
12:12:13 20 them to say precisely why they did meanders, either  
21 navigable or not. And therefore, when I reviewed the  
22 surveys and the plats and the field notes, I assumed that  
23 the surveyors were operating under whatever instructions  
24 were in force at the time.

12:30 25 Q. Including the instruction to meander navigable

1 streams?

2 A. They were instructed to do that. And then  
3 depending on which manual they're working under, there  
4 were other circumstances where they did meanders that are  
12:12:43 5 for not navigable purposes.

6 MS. LIVESAY: Mr. Chairman, I just noticed  
7 the time. Do you want me to continue? I still do have --

8 CHAIRMAN EISENHOWER: Ms. Livesay, are you  
9 going to propose to go through that entire stack?

12:12:57 10 MS. LIVESAY: No, Mr. Chairman.

11 DR. LITTLEFIELD: I would be happy to,  
12 Mr. Chairman. I would be glad to go through every single  
13 township if you would like.

14 COMMISSIONER ECHEVERRIA: No.

12:13:07 15 CHAIRMAN EISENHOWER: I think that you've  
16 established your point that you're trying to make, and I  
17 understand that point, but if we can move forward.

18 MS. LIVESAY: What I was offering,  
19 Mr. Chairman, is would this be a good time to take a  
12:13:22 20 break?

21 CHAIRMAN EISENHOWER: We were planning on  
22 breaking about 12:30, so that gives you about another  
23 15 minutes to -- unless you want to carry on after lunch?

24 MS. LIVESAY: I hope not, but I can't  
1 13:35 25 promise.

1 CHAIRMAN EISENHOWER: Okay.

2 BY MS. LIVESAY:

3 Q. Dr. Littlefield, would you agree with me that in  
4 this township 4 south, range 6 west, the surveyor was  
12:13:44 5 determining fractional sections?

6 A. Yes, those are the words used.

7 Q. And he was looking for meander posts and setting  
8 meander posts as part of his work?

9 A. That's correct. I think you said the fractional  
12:14:08 10 section was in reference to the fact that he was doing  
11 less than a complete section, meaning a quarter section or  
12 a half section or something to that effect.

13 Q. Yes. As we read from Mr. White's book earlier  
14 this morning?

12:14:21 15 A. Right.

16 Q. Okay. Now, I would like you to look at book 1743  
17 of the field notes.

18 A. I don't have that with me.

19 Q. I'll just hand it to you. It should be in the  
12:14:38 20 that file folder. But what I'd like you to confirm for  
21 me, when I hand it to you, Dr. Littlefield, is that the  
22 field notes at chains 14.72 -- or 12, I'm not sure which  
23 it is -- the highlighted portion makes reference to the  
24 use of a ferry?

? 14:55 25 A. Yes, it does.

1 Q. Do you agree with me that he was setting  
2 fractional sections and meander posts? I'm going to be  
3 able to shorten this up a little bit. And again, book  
4 1743, page 2, in the narrative here, would you agree there  
12:15:51 5 is another reference to the ferry?

6 A. Yes, it is.

7 Q. Let's go to page 44 of your report. I'm sorry,  
8 it's actually page 39.

9 A. Yes, I have that page.

12:16:50 10 Q. And that's dealing with township 5 south, range 4  
11 west, correct?

12 A. You're talking about the heading at the bottom of  
13 the page?

14 Q. Yes.

12:16:59 15 A. Yes, I have that.

16 Q. And the discussion continues over to the next  
17 page, page 40. And if I understand it, Dr. Littlefield,  
18 what you're saying here is that the surveyor, Mr. Foreman,  
19 set meander markers only on the left edges of the Gila  
12:17:16 20 River?

21 A. That's what my report says.

22 Q. And your conclusion is that he did this  
23 consistent with the 1864 instructions that allowed for  
24 meandering of only one bank of the river. Is that  
17:41 25 correct?

1 A. Yes. He explains it, as I pointed out in my  
2 report, he said -- quoting me first, and then I'll point  
3 out where his quote begins, "Foreman explained in the  
4 meander section of the field notes for this township  
12:17:54 5 that" -- and this is Foreman's quote -- "'the reason for  
6 selecting the left bank for meanders is that all the lands  
7 of value are on the left bank.'" And then my statement  
8 again -- "He added that the lands on the right bank" and  
9 then Foreman, quote, pinched out, unquote, "due to the  
12:18:14 10 proximity of mountains." And then my concluding  
11 statement, "In other words, the only lands useful for  
12 farming were along the left bank, and for that reason,  
13 Foreman had meandered that bank as Hasson," the surveyor  
14 general, "had told him to do."

12:18:25 15 Q. But that in and of itself, Dr. Littlefield,  
16 doesn't mean that the Gila River was not navigable at that  
17 point, does it?

18 A. That's what the surveyor said. I'm just quoting  
19 what he said.

12:18:37 20 Q. Right. But he doesn't say that he didn't meander  
21 the right bank because it wasn't navigable, just because  
22 the land wasn't useful. That was his stated reason,  
23 right?

24 A. I can't prove a negative on that. I can just  
18:48 25 tell what you he said.

1 Q. Okay. Let's take a look at the field notebook  
2 1634.

3 (An off-the-record discussion ensued.)

4 BY MS. LIVESAY:

12:19:00 5 Q. It should be in township 5 south, range 4 west  
6 folder.

7 A. Okay.

8 Q. And up at the right-hand corner, the page I'm  
9 interested in looks like it's marked R4, but it could be

12:19:15 10 124.

11 A. I have that page.

12 Q. All right. At -- chain 73.50 indicates that he  
13 set a meander post on the left bank, correct?

14 A. Right.

12:19:27 15 Q. But at 76.00 he indicates that he set a post on  
16 the right bank, doesn't he?

17 A. It doesn't says it's a meander post. He said he  
18 crossed over and set another post there, he didn't  
19 indicate that it was a meander post.

12:19:43 20 Q. What other kind of post could it have been?

21 A. Could have been a witness post.

22 Q. Which would establish -- could also be used to  
23 set meanders, correct?

24 A. The surveyors that I indicated earlier frequently  
1 19:52 25 interchanged the terms, which is why the later

1 instructions were more precise. I can't explain why he  
2 used the terminology that he did here other than to recite  
3 what the document says.

4 Q. I understand that.

12:20:07 5 If you turn to book 1165, page 56.

6 A. I have that page.

7 Q. We have the same situation here, don't we, Dr.  
8 Littlefield? At 35.00, he sets a meander corner on the  
9 left bank, and then at 40.00, he sets a witness corner on  
12:20:27 10 the right bank?

11 A. Correct. And I think that's consistent with his  
12 instructions to do a one-bank meander if it's a course for  
13 internal communication only. He's indicating he's only  
14 meandering one bank and he is not going to meander the  
12:20:40 15 other bank, which in fact, is what he did.

16 Q. Let's go to book 1165, page 60. If it's in your  
17 folder the same as mine, it should be about three pages  
18 from where you are. And the 60 is stamped in the upper  
19 left-hand corner of the note.

12:21:16 20 A. Yes, I see that.

21 Q. And there, at chain 5.00, on the right bank of  
22 the Gila River, he set a post for a meander corner,  
23 correct?

24 A. That's correct.

1 21:32 25 Q. And at 8.20, he set a meander post on the left



1 bank, correct?

2 A. That's correct. But I think that if you look at  
3 the rest of the document, he only meandered one bank  
4 regardless of what he called those posts.

12:21:52 5 Q. And then do you see a grid in your materials  
6 about three pages further down?

7 A. It's behind the page we just dealt with?

8 Q. Yes. It should be about three more pages in the  
9 materials.

12:22:23 10 A. Is it numbered page 1 in the upper left-hand  
11 corner?

12 Q. Yes, 1-A.

13 A. No, I just see page 1.

14 Q. Well, let me give you 1-A. It should be in  
12:22:33 15 there.

16 A. I have 1-A.

17 Q. And at the bottom of the grid, it identifies it  
18 as meanders 64 to 68?

19 A. That's correct. We've also discussed that he did  
12:22:47 20 meander one bank in this township. You might note that he  
21 also was the one that dealt with the upstream -- or the  
22 adjacent township.

23 Q. Beginning on page 44 of your report --

24 A. With the heading at the bottom "1878 Interior  
? 23:31 25 Survey of Township 8 South, Range 17 West (Field Notes)"?

1 Q. Correct.

2 A. Yes, I have that.

3 Q. And that discussion continues on to page 45?

4 A. Correct.

12:23:40 5 Q. Do you agree that in this section, the surveyor  
6 was also identifying fractional sections?

7 A. I don't know whether he was or not without  
8 looking back at the field notes. I believe that I only  
9 discussed where he ran section lines. I don't recall the  
10 fractional sections.

12:24:07 11 Q. You should have there the folder for this  
12 section, 8 south, 17 west.

13 A. I have the folder.

14 Q. Book 1172, the first page. There is not a page  
12:24:37 15 number that I can see on here, but it deals with chains --  
16 I think 21.70?

17 A. Page 7 in the left corner?

18 Q. Yes. There it is. Thank you.

19 A. Yes, I have that.

12:24:49 20 Q. Do you see there about the middle of the page in  
21 chain 4810 -- it's very difficult to read. I grant you  
22 that, but I'll show you my copy where I've highlighted it.  
23 Can you tell from that that the surveyor was identifying  
24 fractional sections?

25:15 25 A. Yes. As I indicated, what he's talking about

1 here is that he is running a line that's not along the  
2 edge of an exact -- not along the edge of one section  
3 separating another, he's running a line that is  
4 identifying a partial section.

12:25:41 5 Q. And we can go through it page by page if need be,  
6 Dr. Littlefield, but would you agree that a general  
7 statement about this section of work that the surveyor was  
8 identifying fractional sections?

9 A. In many cases they did, yes.

12:25:49 10 Q. Okay. Thank you.

11 A. I might add that the later surveys have more  
12 interior section surveys than the earlier ones.

13 Q. Now, on page 47 of your report, you talk about an  
14 1890 Interior Survey of Township 8 South, Range 21 West.

12:26:31 15 A. Yes. That's the heading on the page.

16 Q. And in the middle of the second paragraph in your  
17 report you state that he -- "Martineau clearly did not  
18 consider the Gila River to be navigable because he  
19 explained in his field notes that his setting of meander  
12:26:50 20 corners on both banks was consistent with the new  
21 January 1890 instructions." Do you see that?

22 A. Yes.

23 Q. Can you point me to anywhere in his field notes  
24 where he makes that statement?

27:03 25 A. I believe that's my interpretation because he

1 says he's relying on the 1890 instructions, which provided  
2 for surveying bodies of water that may not be navigable  
3 under circumstances that, under the 1881 instructions, for  
4 three chains and wider and, under the 1890 instructions,  
12:27:23 5 three chains or less if they were not useful for  
6 homesteading.

7 Q. I understand that, Dr. Littlefield; the problem  
8 I'm having is that in looking at his field notes, I could  
9 not find a statement that -- where he said he was doing  
12:27:40 10 them in accordance with the 1890 instructions for the  
11 purposes you have just explained. Are you aware of a  
12 specific statement that the surveyor made to that effect  
13 or is that your interpretation?

14 A. That's my interpretation.

12:27:50 15 Q. Thank you.

16 And --

17 A. I think it's a reasonable one in light of all the  
18 other historical documentation surrounding that particular  
19 area at that time.

12:28:04 20 Q. Now, Mr. Martineau did set witness corners and  
21 meander corners in this section, didn't he,  
22 Dr. Littlefield?

23 A. You mean this township?

24 Q. I'm sorry, yes.

28:14 25 A. Yes, he did.

1 Q. Okay. And he also made the statement that at one  
2 point the river was 12 to 15 feet deep, correct?

3 A. I don't recall, but I'll take your word for it if  
4 he did.

12:28:23 5 Q. Okay.

6 A. The other surveyors indicated water in some  
7 cases, too.

8 This, by the way, is almost at the mouth of  
9 the Gila River at the Colorado River, which would be an  
12:28:44 10 area where you might get a lot of backflow from the  
11 Colorado River.

12 Q. Now, page --

13 CHAIRMAN EISENHOWER: Ms. Livesay, before  
14 you get started on a new line, it's 12:30. We're going to  
12:29:00 15 take a lunch break. Let everybody stretch and go get a  
16 bite to eat. We'll come back in approximately one hour  
17 depending on the waiter.

18 (The lunch recess was taken.)

19 CHAIRMAN EISENHOWER: We're ready to resume  
13:51:27 20 our hearing.

21 So Ms. Livesay, I'll defer to you and  
22 Dr. Littlefield so you can continue.

23 MS. LIVESAY: Thank you.

24 CHAIRMAN EISENHOWER: And before we get  
51:37 25 started, I do intend to finish the Gila River today, so if

1 we can move along expeditiously, I'd really appreciate it  
2 and I think everybody else would too.

3 MS. LIVESAY: Thank you, Mr. Chairman,  
4 members the commission.

13:51:49 5 (Dr. Littlefield is answering questions.)

6 BY MS. LIVESAY:

7 Q. Dr. Littlefield, I just have a few more questions  
8 for you.

9 A. Okay.

13:51:53 10 Q. If you turn to page 52 of your report, please?

11 A. Yes, I have that page.

12 Q. At the bottom of the page you're talking about  
13 the 1871 Interior Survey of Township 5 South, Range 5  
14 West. Do you see that?

13:52:25 15 A. Yes. I should clarify in case people don't  
16 understand. By "interior," I mean the surveys that were  
17 done of the section lines as opposed to the surveys that  
18 were done separating townships for exterior surveys.

19 Q. In this section of your report, at the very  
13:52:41 20 bottom of the -- the last sentence that starts at the  
21 bottom of page 52, you're talking about his observations  
22 and his setting of posts, sometimes calling them meander  
23 posts and sometimes not. Do you see that?

24 A. Yes.

52:57 25 Q. And those posts that he set, he set them on both

1 the right and the left bank of the river, correct?

2 A. I would assume so. I don't know whether he made  
3 a distinction in terms of setting meander on one side and  
4 other posts on the other, but yes he set them -- there  
13:53:16 5 were posts on both sides of the river, if that's what  
6 you're asking.

7 Q. Yes. And sometimes he called them meander posts  
8 and sometimes he didn't, but the point is, he set them on  
9 both banks of the river?

13:53:28 10 A. Correct.

11 Q. Okay. On the next page, on page 53, you are  
12 still talking about that same section of the Foreman  
13 survey.

14 A. Yes.

13:53:44 15 Q. And you start talking in the middle of the first  
16 full paragraph about what he did being consistent with  
17 1864 survey manual, and then you talk about the so-called  
18 three chains rule there. Do you see that portion?

19 A. Right. And well-defined routes for internal  
13:54:01 20 communication.

21 Q. The reference to three chains wide or more than  
22 three chains wide, again, is not noted specifically by  
23 Foreman in his field notes, correct?

24 A. I don't remember.

54:16 25 Q. We can go through it again, but would you agree

1 with me that you can't point me to any specific place in  
2 his field notes, can you, Dr. Littlefield, where he  
3 specifically references the three chain rule?

4 A. I don't remember.

13:54:30 5 Q. Okay. Now, you quote extensively there a  
6 paragraph from his field notes on page 53 of your report.  
7 And you talk in the middle of that paragraph -- the  
8 surveyor says, "The Gila [River] is at times subject to  
9 very high freshets, and at all times even at a low stage  
13:54:57 10 of water as at present runs a volume of water equal to  
11 about 100,000 inches." Now, 100,000 inches, Dr.  
12 Littlefield, is equal to 2,500 CFS, correct?

13 A. Depends on what state you're in. Miner's inches  
14 vary from state to state, and I don't know precisely --  
13:55:20 15 and also, for that matter, did vary from mining camp to  
16 mining camp. There were eventually some attempts to  
17 standardize that, and I don't know specifically what  
18 Mr. Foreman is talking about in terms of which state  
19 standard he's using or which mining camp standard. All I  
13:55:38 20 know is he said that it was 100,000 inches.

21 Q. Well, what was the standard for the State of  
22 Arizona when Mr. Foreman was doing his survey?

23 A. I don't know.

24 Q. And then he goes on to say, "It has a fall of  
55:52 25 about 20 feet to the mile in [the] township and flows over



1 a sandy bottom and is fordable at nearly all points except  
2 in time of high water, when it become almost impassable  
3 for boats ..." Do you see that?

4 A. Yes.

13:56:12 5 Q. Then he goes on to say "... which precludes men  
6 from owning farms lying on both sides of the river - hence  
7 the necessity for meandering the stream." Do you see  
8 that?

9 A. Yes.

13:56:24 10 Q. And do you recall, Dr. Littlefield, that in his  
11 field notes, the surveyor made reference to the river  
12 having 14 inches of water in it at the time he was making  
13 these observations?

14 A. I don't remember precisely. It wouldn't surprise  
13:56:40 15 me if he did.

16 Q. And it is what it says it is in field notes, you  
17 would agree?

18 A. Yes.

19 Q. Okay. Now, on the top of page 54, you quote a  
13:57:02 20 note where, "He offered this explanation for meandering  
21 only the left bank: 'Note: The left bank of the river is  
22 taken by me in preference to right bank because the lands  
23 north of the Gila in this township are worthless.'" That  
24 statement in and of itself is not a judgment regarding the  
57:22 25 navigability of the river, is it, Dr. Littlefield?

1           A.    No. It's simply the explanation as to why he  
2 meandered the bank he did.

3           Q.    Still on page 54, you go on to 1910 Interior  
4 Survey of Township 5 South, Range 8 West.

13:57:43 5           A.    Correct.

6           Q.    The survey was taken -- or was done on  
7 December 14th and 15th, 1910, correct?

8           A.    Yes.

9           Q.    Do you have any idea, Dr. Littlefield, at that  
13:58:03 10 point in time, how much water was being diverted from the  
11 Gila River?

12          A.    No.

13          Q.    And would you agree with me that in that 1910  
14 interior survey, Mr. Hesse was identifying fractional  
13:58:17 15 sections?

16          A.    Without looking at the actual survey, I don't  
17 remember. Typically the surveys that were done later in  
18 time did smaller interior fractional sections such as  
19 quarter sections and so forth. So you're more likely to  
13:58:37 20 find quarter section surveys in later surveys than in  
21 earlier ones.

22          Q.    Do we have the folder for township 5 south, range  
23 8 west? If you look in there, hopefully the first thing  
24 you'll see is pages from book 1638.

58:57 25          A.    Yes.

1 Q. Okay. The second page in that portion is page 35  
2 in the upper right-hand corner. Do you see the note there  
3 at the top of the page, and would you agree with me that  
4 that note and the next one both refer to fractional  
13:59:16 5 sections?

6 A. Yes. This is the -- he's referring to the corner  
7 between section 7 and 12. So he is referring to the  
8 fractional quarter section that -- where those particular  
9 sections meet or adjacent.

13:59:32 10 COMMISSIONER HENNESS: Excuse me. I'd like  
11 to ask a question. Could you geographically, kind of,  
12 describe where these townships are? It would be helpful  
13 for me. Are we talking about below Phoenix? Are we  
14 talking about below Safford? Where are these townships  
13:59:49 15 that we're dealing with? What block of the -- it would  
16 just be helpful.

17 MS. LIVESAY: Dr. Littlefield, I have a map  
18 here with all the township and ranges on them. If --  
19 maybe you can illustrate.

14:00:04 20 COMMISSIONER HENNESS: Just give me the  
21 parameters of it. East and west.

22 MS. LIVESAY: What we have just been talking  
23 about is township 5 south, range 8 west. So -- here, this  
24 is township 5 south, 8 west.

14:00:46 25 MR. HENNESS: Where are we? Where's red,

1 Phoenix? What is the red part?

2 DR. LITTLEFIELD: It's near Gila Bend.

3 COMMISSIONER HENNESS: These areas that you  
4 are talking about are west of the junction?

14:00:59 5 MR. HELM: All of them that we're talking  
6 about in this is the lower Gila from the junction of the  
7 Salt.

8 COMMISSIONER HENNESS: Okay, thank you.

9 MR. HELM: They're all located between there  
14:01:10 10 and the Colorado River.

11 COMMISSIONER HENNESS: That's helpful for  
12 me. Probably meaningless for your discussion, but it's  
13 helpful for me to understand just where you're talking  
14 about.

14:01:20 15 MS. LIVESAY: That's why over lunch I went  
16 and got this out so you could have it for illustration.

17 BY MS. LIVESAY:

18 Q. Now, I just have a few questions in summary of  
19 this portion, Dr. Littlefield. If you go back to page 18  
14:01:34 20 of your report?

21 A. Are we done with this folder, township 5, range  
22 8?

23 Q. Yes, we are.

24 A. I'm sorry, what page did you want in my report?

01:42 25 Q. 18.

1 A. Yes, I have that page.

2 Q. I am confused about one statement you make in the  
3 middle of that paragraph relating to the 1890 manual.

4 Right in middle there's a sentence, "Surveyors also still  
14:02:03 5 were instructed" -- are you with me?

6 A. Yes.

7 Q. "Surveyors also still were instructed to set a  
8 witness post on line at the edge of the non-navigable  
9 obstacle," and then it goes on from there. You do not

14:02:20 10 mean to imply that witness posts were only used for  
11 non-navigable rivers, do you?

12 A. Are you talking about in theory or in practice?

13 Q. Well, let's start with in practice.

14 A. As I indicated in my testimony earlier, it was

14:02:41 15 not unusual for surveyors to sometimes call posts meander  
16 posts when what they really meant was witness post and  
17 vice versa. The theory, I think, is pretty well set out  
18 in Mr. White's book that witness posts were only to be  
19 used in relation to non-navigable bodies of water, but not  
14:03:02 20 all surveyors were very precise about following that rule.

21 Q. So it's your testimony that Mr. White's book  
22 instructs that witness posts are only to be used where the  
23 body of water is non-navigable?

24 A. Mr. White doesn't make that instruction, he

03:16 25 reprints the instructions from the original manuals, which

1 I believe I'm remembering correctly, said that witness  
2 posts were used on -- where they were not crossing  
3 navigable -- where they were crossing non-navigable bodies  
4 of water and meander posts were there crossing navigable  
14:03:35 5 bodies of water. But in -- not all cases did they  
6 religiously adhere to that instruction.

7 Q. Since the page that we looked earlier, page 461  
8 of Mr. White's book -- I'm handing it to you -- where we  
9 discussed the section "Insuperable Obstacle on line  
14:04:19 10 Witness Post."

11 A. Yes, I see that.

12 Q. And that's the section that you are referring to?

13 A. Well, it depends on which survey you're talking  
14 about because there are different manuals for different  
14:04:27 15 times.

16 Q. But I thought we agreed that the language was the  
17 same with respect to that section?

18 A. Not all the way through all the manuals, no.  
19 It's pretty much the same in the earliest -- the manual  
14:04:39 20 for Oregon and the 1855 and then I believe the 1864  
21 instructions. But beginning with 1881, you get quite a  
22 bit of variance in terms of how surveyors were to deal  
23 with non-navigable bodies of water that also needed to be  
24 meandered. So you cannot uniformly say that this  
05:00 25 instruction, which is -- I believe it's for the Oregon

1 manual, the first one. Now the 1855 -- well, anyway, one  
2 the first ones. You can't say that uniformly the  
3 instructions are the same all the way through all the  
4 manuals because they're not. That was the point of all my  
14:05:19 5 discussion in my report, to make that clear.

6 Q. Dr. Littlefield, since you have the entire book  
7 there, could you direct our -- or the committee's -- the  
8 commission's attention to the specific instruction in the  
9 appropriate portion of the manual that says that witness  
14:05:38 10 points -- posts or corners are only to be used in  
11 instances of a non-navigable river?

12 A. If you looked on page 461, the right-hand column,  
13 there's a discussion about meander posts. It's item  
14 number 4 under large block heading number 6. It says,  
14:05:57 15 "Meander corner posts are planted at all those points  
16 where the township or section lines intersect the banks of  
17 such rivers, bayous, lakes, or islands as are, by law,  
18 directed to be meandered."

19 It's my recollection that that particular  
14:06:13 20 instruction does not include witness posts, it only  
21 includes meander posts. And with relation to navigable  
22 bodies of water, the witness posts were set, in theory at  
23 least, in relation to non-navigable bodies of water.

24 Q. If you look over just one column to your left,  
06:32 25 under Insuperable Objects on line Witness Points. Tell me

1 if the text states this: "And at the intersection of  
2 lines with both margins of impassable obstacles, you will  
3 establish a witness point." Does it say that?

4 A. It does. But it says "impassable obstacle," it  
14:06:56 5 doesn't say -- the impassable obstacle that they are  
6 referring to there is cumulative, it includes navigable  
7 bodies of water, but it includes a lot of other things  
8 too.

9 Q. Okay, thank you.

10 A. So witness posts were set in a variety of cases.  
14:07:07 11 But as item number 4 indicates, in the right-hand column,  
12 they were to use meander posts just for navigable bodies  
13 of water. And I think that maybe your question  
14 illustrates maybe why there was some confusion on the part  
14:07:24 15 of the surveyors as to whether they were calling them  
16 meander posts or witness posts.

17 Q. Okay.

18 A. Clearly there's some misunderstanding here too.

19 Q. As far as the surveyor's notes are concerned, if  
14:07:35 20 they set a witness post, depending on what was going on in  
21 the mind of that particular surveyor at the time he was  
22 doing it, it could have related to navigability or it  
23 might not have. We just don't know. Is that what your  
24 testimony is?

07:54 25 A. As I indicated, there is a difference between the



1 theory and the practice, and I don't know which one you're  
2 asking about.

3 Q. In practice?

4 A. As I already testified, clearly, for example,  
14:08:09 5 Mr. Foreman used -- set meander posts in place where, in  
6 my view of the historical record, he was not setting them  
7 for reasons of navigability. And there were other  
8 instances, not only on this river, but also on many of the  
9 other rivers that I looked at in the West where there were  
14:08:28 10 similar discrepancies. It was not at all uncommon.

11 Q. Okay, thank you.

12 Just so I'm very clear about your testimony,  
13 this is the way I understand. You view the survey  
14 instructions as having been progressed with respect to  
14:08:51 15 meandering. In 1855, the surveyors were supposed to  
16 meander both sides of a navigable river, correct?

17 A. Yes.

18 Q. In 1864, they could meander one bank of a  
19 well-defined natural artery of internal communication?

14:09:10 20 A. And both banks if the body of water was  
21 navigable.

22 Q. They could do both, correct?

23 A. Depending on which it was, correct.

24 Q. And in 1890, the instructions deleted the  
09:22 25 internal communication instruction but they added the

1 so-called three chains rule?

2 A. Right. And that was further modified, I believe,  
3 in 1901, which changed the instruction from three chains  
4 or wider. In 1902, they changed it to say even for three  
14:09:41 5 chains or less, if it's so impassable as to be worthless  
6 for farmland, you can go ahead and meander that too.

7 Q. How wide is three chains, Dr. Littlefield?

8 A. One chain, a hundred -- a hundred feet. I'm  
9 sorry, a hundred links, 66 feet.

14:09:56 10 Q. So three chains is almost 200 feet?

11 A. Ballpark, yes.

12 Q. Could you show me the places on the Gila River in  
13 the lower Gila stretch that we've been talking about where  
14 the river is less than three chains wide?

14:10:11 15 A. Are you talking about today?

16 Q. Yes. I'm asking if you can show me today.

17 A. I have no idea of how wide the river is today.

18 Q. I'm sorry, I meant to do it today. No, at the  
19 time the surveys were being done between 1865 and 1912?

14:10:30 20 A. If you would like to go back through township  
21 through township, I can do that. Without being able to  
22 look at the notes and deal with them directly, I can't do  
23 it from memory. There's just too much information to deal  
24 with it from memory.

10:45 25 Q. Can you point out, let's say, three places from

1 memory where the river is less than three chains wide?

2 MR. MCGINNIS: Just a point of order. That  
3 question has been asked and answered. We have been here  
4 now two hours talking about surveys. He just answered the  
14:11:00 5 exact same question. She asked him if he could point any  
6 out, he said "No." Now, she's asking him to point three  
7 out. There's not much difference between three and any if  
8 the answer is no to any question.

9 MS. LIVESAY: I'm sorry, I thought he said  
14:11:13 10 yes he could, but it would take him a long time to do it.

11 And Mr. Chairman, I'm just asking him if he  
12 can do two or three for me right now without taking a lot  
13 of time.

14 CHAIRMAN EISENHOWER: Well, I think he said  
14:11:23 15 that if he went back through all the survey notes then he  
16 can find it, but if you want him to do -- but is it  
17 totally necessary in your estimation?

18 MS. LIVESAY: It would be very helpful to us  
19 in preparation of our post-hearing memorandum to know  
14:11:40 20 where Dr. Littlefield believes that the river was less  
21 than three chains wide. And if he feels comfortable doing  
22 it, I will let him just mark right on my map where he  
23 thinks two or three places where it is less than three  
24 chains wide.

11:53 25 COMMISSIONER HENNESS: Did Mr. Littlefield

1 offer to work with you on that whole setup? It seems a  
2 bit unreasonable that you're asking him to come from  
3 memory about three townships between the confluence of the  
4 river and Yuma that he can tell you the width of. But did  
14:12:16 5 he not volunteer to help you with -- --

6 MR. HELM: He can submit a list of the  
7 areas, the townships that he maintains are that before our  
8 30-day deadline so we have some chance to use it. We'd be  
9 perfectly happy just to have that.

14:12:36 10 DR. LITTLEFIELD: I think I can probably  
11 help out here.

12 Any list that I would submit is going to  
13 include all of the townships that you already have copies  
14 of the field notes to. So all you really need to do is go  
14:12:44 15 through all those field notes and see where the surveyor  
16 crossed the river on line and he will indicate whether it  
17 was three chains or less and how many more or how many  
18 less. It's in notes. You can do that for every single  
19 township.

14:12:57 20 BY MS. LIVESAY:

21 Q. Okay. And if it's not in notes, then do you have  
22 any other way of knowing those places where the river is  
23 less than three chains wide?

24 A. My analysis only dealt with what the surveyor  
13:09 25 said, and as a result, you would get as much out the notes

1 as I had already gotten by going through them myself.

2 Q. Okay, thank you. That's good enough.

3 And I would just like to ask you one last  
4 question, Dr. Littlefield, if you would agree with this  
14:13:26 5 statement, which is from the United States Supreme Court  
6 case Railroad Company versus Schurmeir, 74 U.S. 272, it's  
7 an 1868 decision. So for starters, you would agree that  
8 1868 is within the relative time frame that these surveys  
9 were being done, correct?

14:13:49 10 A. It was toward the beginning when they were being  
11 done, yes.

12 Q. Okay. This is the statement: "Meander lines are  
13 run in surveying fractional portions of the public lands  
14 boarding on navigable rivers not as boundaries of the  
14:14:03 15 tract, but for the purpose of defining the sinuosities of  
16 the banks of the stream, and as the means of ascertaining  
17 the quantity of land in the fraction subject to sale,  
18 which is to be paid for by the purchaser.

19 "In preparing the official plat from the  
14:14:23 20 field notes, the meander line represented as the border  
21 line of the stream and shows to a demonstration that the  
22 watercourse and not the meander line is actually run on  
23 the land is the boundary." Do you agree with that?

24 COMMISSION COUNSEL JENNINGS: Mr. Chairman,  
14:39 25 is the question as to whether he agrees the Supreme Court

1 said that in one of its opinions?

2 MS. LIVESAY: Let me rephrase the question.

3 Thank you.

4 COMMISSION COUNSEL JENNINGS: That's what I

14:14:48 5 understood you to ask.

6 BY MS. LIVESAY:

7 Q. Would you agree that that would be an  
8 understanding that the surveyors of this time would have  
9 when they were making their surveys?

14:14:57 10 A. I think I can answer a question in the way that  
11 will help you out. I think that you misunderstand what it  
12 means when it says it's a fractional survey.

13 The fractional surveys that are mentioned in  
14 the surveyor's notes routinely refer to parts of sections,  
14:15:10 15 meaning not 160 acres but parts of sections, quarter  
16 sections, half sections, and so on. So when they're  
17 talking about fractional surveys, in almost every single  
18 instance that you brought up in any testimony here, they  
19 were not talking about what were referred to as government  
14:15:28 20 lots.

21 Government lots are the small irregular  
22 parcels that you find along navigable bodies of water,  
23 they are typically numbered, they are identified as  
24 government lots, but they are also sometimes referred to  
15:42 25 as fractional surveys because they aren't 40-acre blocks.

1 So I think you have confused the two. And to the extent  
2 that my testimony or what you've brought out here, where I  
3 have been asked to identify all of these fractional  
4 surveys, to the best of my knowledge, none of those  
14:16:01 5 fractional surveys refer to government lots. They do  
6 refer to 40-acre blocks, 80-acre blocks or some subset of  
7 a full section.

8 Q. Dr. Littlefield, my only question was, this  
9 Supreme Court case came out in 1868, would you agree that  
14:16:17 10 that decision by the United States Supreme Court  
11 concerning meander lines and fractionals would be  
12 something that the surveyors who performed the work that  
13 we have been looking at would have been aware of when they  
14 were conducting their surveys?

14:16:30 15 A. To the best of my knowledge, the surveyors did  
16 not know anything at all about U.S. Supreme Court  
17 decisions. I think they left the decisions to be  
18 interpreted by the higher-ups in the Land Department,  
19 which was part of the reason why they went -- the  
14:16:43 20 higher-ups in the Land Department went back and attempted  
21 to clarify through the revision of these manuals what they  
22 were supposed to be doing on meanders. The surveyors were  
23 experts in surveying. They were not lawyers and they  
24 weren't judges. And I don't think they read Supreme Court  
16:57 25 case decisions.

1 MS. LIVESAY: Thank you.

2 MR. HELM: My turn, Dr. Littlefield. Good  
3 to see you.

4 DR. LITTLEFIELD: Good to see you, Mr. Helm.

14:17:12 5 BY MR. HELM:

6 Q. John Helm for Maricopa County.

7 Last night I paped through the notes I had  
8 prepared before I found out you had submitted a new report  
9 and tried to separate some to shorten this up. And I got  
14:17:33 10 to the point where I can get rid of these just to give you  
11 some incentive if I can get a couple of questions  
12 answered.

13 The first question being, do you recall  
14 giving a deposition in the Gillespie Dam case?

14:17:49 15 A. Yes, I do.

16 Q. Okay. In that case you were an expert witness  
17 for one of the parties?

18 A. I was retained by Emery Barker on behalf of -- I  
19 don't remember full title of -- but Paloma.

14:18:00 20 Q. Paloma Ranch Interests?

21 A. Yes.

22 Q. Including those interests who owned the dam?

23 A. That's my understanding. I don't know exactly.

24 Q. Okay. At the time you were hired by Mr. Barker,  
18:11 25 or at least at the time that you were disclosed, you had



1 completed your work on the first report that you did for  
2 the Salt River Project, hadn't you?

3 A. On the Gila River?

4 Q. Yes.

14:18:24 5 A. Yes.

6 Q. And you sought the Salt River Project's  
7 permission to act as Mr. Barker's expert, didn't you?

8 A. I didn't seek it personally. I told Mr. Barker,  
9 he contacted me. And I told him that I didn't object to  
14:18:41 10 doing some work on his behalf, but he would have to  
11 discuss the matter with the attorneys at Salmon, Lewis and  
12 Weldon and the Salt River Project.

13 Q. And they gave you permission, ultimately, to  
14 serve as a witness?

14:18:49 15 A. Yes.

16 Q. And they used the information and documents that  
17 you had prepared for the Salt River?

18 A. Correct.

19 Q. Okay. Now, on another topic -- well, let me  
14:18:57 20 finish up on that first.

21 As a result of that employment, you  
22 ultimately gave a deposition in that case, correct?

23 A. The Paloma case?

24 Q. Yes.

19:12 25 A. Yes.

1 Q. Okay. And in that deposition, quite an extensive  
2 part of that took place in a review of the report you had  
3 written at that point for the Salt River, correct?

4 A. I haven't read the transcript recently, but  
14:19:25 5 that's my recollection.

6 Q. Mine too.

7 And I don't know if you're aware -- I'm  
8 sure -- we filed that transcript with the commission as  
9 part of our evidence in this matter. But the point that I  
14:19:44 10 want to ask you is, do you have any of the statements that  
11 you can recall making from that transcript that you want  
12 to disavow as we stand here today?

13 A. Not that I recall.

14 Q. And will you stand by those statements as far as  
14:20:01 15 they relate to the testimony that you have given here and  
16 that's evidenced in the report that you prepared?

17 A. Yes.

18 Q. Well, that -- you got rid of a whole bunch of  
19 them.

14:20:17 20 And I assume that the commission will accept  
21 that transcript?

22 CHAIRMAN EISENHOWER: The deposition  
23 transcript?

24 MR. HELM: Yes.

20:26 25 CHAIRMAN EISENHOWER: Yes, we have that.

1 BY MR. HELM:

2 Q. Okay. Now, just a few items I have to go  
3 through, regrettably though, we may have talked to them.

4 First of all, you don't claim any expertise  
14:20:41 5 in civil engineering, hydraulic -- hydrology,  
6 geomorphology, archeology, water engineering, irrigation  
7 design and delivery, dam construction, river guiding, boat  
8 building, surveying, or assaying?

9 A. No.

14:20:56 10 Q. Now, if I understand what your testimony has  
11 been, and what you told us, I believe, in the deposition,  
12 you didn't use any specific legal standard to measure your  
13 conclusion of navigability or non-navigability against?

14 A. Any specific legal standard?

14:21:22 15 Q. Yes.

16 A. That's correct.

17 Q. For example, you didn't write either your first  
18 or your second report with an intent to comply with the  
19 Defenders of Wildlife case prescriptions?

14:21:34 20 A. I don't recall if -- I think I indicated with the  
21 attorney yesterday -- I don't remember her name -- but I  
22 don't recall if I have read that decision, but likewise,  
23 steamer Daniel Ball. I didn't write my report to comply  
24 with the provisions of either one of those cases.

21:51 25 Q. I can refresh your memory, you read it at the

1 deposition.

2 A. Well, thank you.

3 Q. And it is referenced in there.

4 And the sum and substance of all that is  
14:22:13 5 that your opinions and report shouldn't be taken as an  
6 opinion of navigability comporting with any legal  
7 standard. Is that fair?

8 A. You know, I testified in another case involving a  
9 California river about navigability, and the attorney --  
14:22:28 10 one of the attorneys in that case raised the same issue  
11 about whether the historical parties involved, whether  
12 their testimony or their writings or documents met the  
13 legal standard of certain documents, certain court cases,  
14 and I said no.

14:22:44 15 The judge in that case said you recognize  
16 that historical actors hadn't been discussing their views  
17 of the river with steamer Daniel Ball, but he also noted  
18 that our ancestors weren't all fools and they knew whether  
19 rivers were navigable or not. And I think that's --  
14:23:05 20 essentially what I am trying to do here is, I'm trying to  
21 explain what historical parties were viewing the river as,  
22 not as to whether the river meets a particular legal test  
23 or not.

24 Q. Sure. Could you identify the name of that case?

23:17 25 A. It's in my vitae, which is in the appendix to my

1 report. It's the Kern River case.

2 Q. Kern River case?

3 A. Well, there are several Kern River cases, but  
4 it's the --

14:23:25 5 Q. Which one?

6 A. Nickel versus California, I believe, is the case.

7 Q. All right. Let me see if this is a fair summary  
8 of what you said. I'm offering a conclusion based on many  
9 other parties' opinions about what the river was like and

14:23:50 10 cumulatively they say to me that no matter what standard  
11 you use, the river is not commercially navigable?

12 A. Cumulatively --

13 Q. Is that what you're offering?

14 A. They're cumulatively saying to me that virtually  
14:24:03 15 every historical party involved did not view this river as  
16 being consistently navigable.

17 Q. Okay. Now -- and what you're doing is telling us  
18 what those people that you found quotes from or things  
19 thought about it as you perceived what they're saying?

14:24:23 20 A. Correct.

21 Q. So this is your interpretation of what they said?

22 A. Not so much my interpretation. It's one of the  
23 things that historians do, is we synthesize material. We  
24 bring large amounts of material into our research. We  
24:36 25 reach conclusions based on that. We present those

1 conclusions, and we present all the evidence that supports  
2 those conclusions. And I think that I have done that with  
3 my report. I brought a lot of material here. I've  
4 synthesized it, and I've indicated, as you have just  
14:24:50 5 questioned, that I think virtually all of the historical  
6 parties, none of them thought this river between the Salt  
7 River and the Colorado River was consistently or reliably  
8 navigable.

9 Q. Does that include those surveyors that you just  
14:25:06 10 finished talking with Ms. Livesay about who made findings  
11 during that time period that some of it was specifically  
12 navigable in their opinion?

13 A. I think you misunderstood my testimony, and I  
14 would be glad clarify it.

14:25:18 15 Q. Sure.

16 A. My testimony did not say that they had found it  
17 navigable, and you won't find anything in any of those  
18 surveys notes where they do say it's navigable. In fact,  
19 much to contrary. If you approach this the way a  
14:25:32 20 historian would, instead of being selective with  
21 documents, if you approach this and look at this for the  
22 cumulative impact of the historical record, synthesize it,  
23 analyze it, looking at the forest rather than looking at  
24 individual trees, you will see that what those surveyors  
25:47 25 did is they were dealing with a non-navigable body of

1 water.

2 Q. Okay. Doctor, I think you've agreed that none of  
3 them said it was non-navigable?

4 A. They didn't use that word, correct.

14:26:03 5 Q. Exactly. And I think you've also testified that  
6 they were following the directions in whatever manual they  
7 were doing?

8 A. Correct.

9 Q. And all the manuals before 1891 told them to  
14:26:14 10 meander when they crossed a boundary of a navigable,  
11 didn't they?

12 A. If in their judgment it was navigable, correct.  
13 But there were other circumstances that they were entitled  
14 to use meanders under.

14:26:28 15 Q. And if it doesn't say anything else, we have to  
16 look at the direction because the person who was doing the  
17 surveying on the ground didn't tell us what purpose he was  
18 doing it for, did he? He just did.

19 A. You have to look at the instructions as one of  
14:26:44 20 the larger picture, but you also have to look at what all  
21 the other surveyors did and all of the other historical  
22 documents to put it in its proper perspective --

23 Q. Sure.

24 A. -- excuse me, Mr. Helm -- which is what I think  
26:52 25 is the whole problem with the selective document thing.

1 It does not put it into the bigger picture. The bigger  
2 picture is consistent and it indicates that there is  
3 virtually no one who considered this river to be reliably  
4 navigable, at least not between the Salt River and the  
14:27:11 5 Colorado. And I haven't done any work beyond that, up  
6 river from there.

7 Q. I'm sure that the Commission would like me to go  
8 over every document that you have reviewed so that I would  
9 give them the consistent picture, but we'd be here for a  
14:27:27 10 few months, wouldn't me?

11 A. I'm perfectly willing to go through all of those  
12 documents, document by document, synthesize them and  
13 analyze them, as I have done in my report here. And I  
14 think once you have done that, you will see that there is  
14:27:39 15 a very, very solid presentation about whether this river  
16 is navigable or not from the perspective of historical  
17 actors.

18 Q. But you make a statement that you say there isn't  
19 anything in there that would disagree with your  
14:27:57 20 conclusion. And at least to the extent that some of those  
21 surveyors determined that part of the Gila River was  
22 navigable, one of you is inconsistent, aren't we?

23 A. None of those surveyors determined that river to  
24 be navigable. Some of them did set meanders, but as I  
28:15 25 have indicated over and over and over, none of them



1 indicated that they were setting meanders for purposes of  
2 navigability.

3 Q. What does the 1855 set of instructions tell a  
4 person to do when he gets to a river on a line?

14:28:36 5 A. 1855 says you will meander it if it's navigable,  
6 but they didn't all use that manual. They used later ones  
7 for later surveys, as I have testified repeatedly.

8 Q. What does the 1864 manual say?

9 A. The 1864 adds the clause about meandering one  
14:28:52 10 bank if it's a route for internal communication.

11 MR. MCGINNIS: Mr. Chairman?

12 BY MR. HELM:

13 Q. And if it's a --

14 MR. MCGINNIS: Mr. Chairman, I indulged Mr.  
14:29:00 15 Helm's request to split his cross-examination up between  
16 the surveys and the other information, and we did that.  
17 We spent two hours on the surveys. Now he's back taking a  
18 second bite of the surveys, and I don't think that's fair.

19 MR. HELM: Well, I'll move on.

14:29:14 20 MR. MCGINNIS: If you want to move on to  
21 something else, that's fine. We've been through the  
22 surveys for, my God, who knows how long.

23 MR. HELM: I'll move on. But I didn't  
24 realize that you were in control and ability to indulge --

29:24 25 MR. MCGINNIS: I'm objecting, John. That's

1 the way it works.

2 MR. HELM: That's fine. That's not an  
3 indulgence. Stand up and make an objection if you've got  
4 one. State what it is.

14:29:30 5 COMMISSION COUNSEL JENNINGS: Mr. Chairman,  
6 I have an objection. Counsel continues to argue with the  
7 witness. He should be asking him questions and listening  
8 to answers and not trying to testify himself and argue  
9 with the witness.

14:29:44 10 MR. HELM: Would the record also reflect  
11 that the witness is arguing with counsel? It cuts both  
12 ways, Curtis.

13 DR. LITTLEFIELD: Excuse me. I'm trying to  
14 answer your questions, Mr. Helm, truthfully and as  
14:29:54 15 completely as I can.

16 CHAIRMAN EISENHOWER: Let's keep to the  
17 point, if we may, on both sides here.

18 BY MR. HELM:

19 Q. Now, in your report, you stated that your report  
14:30:04 20 addresses the river in 1912?

21 A. There are historical documents, and my  
22 recollection is that I have documents around that time  
23 that describe the river at various times of year and  
24 different places.

30:17 25 Q. And I believe you have admitted that your report

1 does not deal with the river in either a natural or  
2 ordinary condition but in the condition it was in as of  
3 1912?

4 A. The documents that are in my report describe the  
14:30:35 5 river under the conditions that existed at the time of  
6 those documents.

7 Q. And there was large -- large amounts of diversion  
8 in the river during that period of time. Is that correct?

9 A. Depending on the time you're dealing with, but  
14:30:46 10 yes, there were diversions pretty much during the whole  
11 period my report addresses.

12 Q. And it increased over time?

13 A. Correct.

14 Q. So we get to 1912, there were a lot more  
14:30:58 15 diversions than there were in 1850?

16 A. Correct.

17 Q. Now, at least in your first report -- and I will  
18 admit when I get to your second one, I had to go through  
19 it very quickly because I only had a day -- you used as  
14:31:30 20 part of the standard to determine whether a river was  
21 navigable whether commerce actually was conducted over  
22 that river. Is that correct?

23 A. That was one of the things I looked at.

24 Q. And the commerce you looked at, I believe you  
31:48 25 told me, was the commerce that occurred in and around

1 1912?

2 A. It was whatever commerce was mentioned or lack  
3 thereof in the historical documents that I either reviewed  
4 or talked about in my report.

14:32:05 5 Q. So in determining whether a river was navigable,  
6 one of the criteria that you had for doing that is -- was  
7 commerce conducted on the river, the kind of commerce that  
8 was conducted in and around statehood in 1912?

9 A. If there was any commerce conducted on the river,  
14:32:27 10 I would have examined documents to that effect.

11 Q. Was that a criteria for navigability in your  
12 mind?

13 A. I tried to examine the widest possible sources of  
14 historical material about the Gila, not only including  
14:32:49 15 parties who may have used the river in various ways but  
16 also including parties who viewed it. And one of those  
17 things that I would have examined would have been commerce  
18 as it was conducted on the river because it talked about  
19 the river, and I tried to look at everything that talked  
14:33:00 20 about the river.

21 Q. Let me read you from your deposition at page 49.

22 "Question: And your report is written  
23 with your definition of commercially  
24 navigable as part of your standard, right?

33:14 25 "Answer: That's correct.

1                   "Question: If it wasn't commercially  
2                   navigable, then it wasn't navigable in  
3                   your opinion.

4                   "Answer: Simply because both were used  
14:33:26 5                   on the river does not mean it was commercially  
6                   navigable."

7                   A. That's what I said.

8                   Q. And that's still standard -- and that's the  
9                   standard you use regarding the commercial requirement?

14:33:36 10                  A. As I indicated, commerce, if it was conducted on  
11                  the river, I would have considered that as evidence as to  
12                  the characteristics of the river. Maybe my answer in my  
13                  deposition wasn't particularly artful, but I attempted to  
14                  look at the river from as many perspectives as I can or  
14:33:56 15                  could. And if there was commerce conducted on it, that  
16                  would have been one of them.

17                  Q. Let me give you another quotation. Page 50.

18                                 "Question: I want you to give me your  
19                                 definition of the difference between  
14:34:09 20                                 commercially navigable and navigable.

21   Answer: Commercially navigable, my  
22   understanding of it, is carrying commerce  
23   on a river from point A to point B, which  
24   does not include ferries because ferries  
34:28 25   are a means of avoiding the river at regularly

1 expected times of the year or alternatively  
2 susceptible of carrying commerce on the  
3 river the way commerce was carried on -- on  
4 at the time of statehood at regularly expected  
14:34:44 5 time of the year."

6 You did say that?

7 A. I believe my answer, if I recall correctly, was  
8 with regard to general questions you were posing about my  
9 understanding of the issue of navigability in today's  
14:34:58 10 sense. And I was explaining, if I remember correctly,  
11 that I have indeed read some of the -- at least some of  
12 the court cases that deal with navigability, and some of  
13 them deal with whether commerce is one element of that.

14 Q. When you were doing your report, did you believe  
14:35:19 15 that a river had to be used commercially for navigability  
16 before a river was navigable under the equal footing  
17 doctrine as it's enunciated in the Daniel Ball case?

18 A. I didn't deal specifically with the Daniel Ball  
19 case. I think I made that clear in my deposition as well.

14:35:38 20 Q. Okay. Did you deal or -- in your attempt to  
21 determine whether a river was navigable, was one  
22 requirement the river had to meet -- that it had to have  
23 been used for a commercial use?

24 A. What I did in my report is I presented what the  
36:02 25 historical parties thought about the river. And what they

1 thought about the river was just the opposite, that it was  
2 incapable of any kind of reliable transportation,  
3 commercial or otherwise.

4 Q. I'm not asking --

14:36:14 5 A. I didn't impose my own opinion here. I simply  
6 told you what the historical parties did.

7 Q. So you -- so your testimony here today is that  
8 you did not -- in arriving at your opinion of  
9 navigability, you did not place a commercial navigability  
10 requirement on it?

11 A. You're talking about in a general sense or with  
12 respect to the Gila?

13 Q. With respect to the Gila.

14 A. My intent was to present what the historical  
14:36:46 15 parties thought of the river. And cumulatively, they  
16 thought -- the vast majority of them, if not all of  
17 them -- that it wasn't reliable as a means of  
18 transportation, commercial or otherwise.

19 Q. Okay. Then let me see if I've got it now because  
14:36:55 20 I have been off on a flight of fancy, maybe.

21 This isn't your -- your reports are not your  
22 opinion, they're your compilation of what you think the  
23 people at the time thought about the Gila River?

24 A. It's not just what they thought, it's also what  
37:16 25 they said about the Gila River.

1 Q. And said.

2 A. Yes, and what they --

3 Q. Is that an accurate --

4 A. -- wrote about it, correct.

14:37:21 5 Q. Is that an accurate statement?

6 A. Right. And I -- and from that, I synthesize an  
7 overall report that you have a copy of.

8 Q. Okay. And so it's really not your opinion, it's  
9 just a synthesis of the people who wrote about it and at  
14:37:35 10 the time they wrote about it or spoke about it -- I guess  
11 you couldn't have really figured out how they thought  
12 about it.

13 A. It's my opinion that the vast majority thought of  
14 it as being non-navigable as of 1912 or earlier. And  
14:37:48 15 thus, my conclusion has to be that if they all thought it  
16 was non-navigable in 1912 or earlier, I can only reach one  
17 conclusion from that, and that's that anybody who had  
18 anything to do with the river in 1912 or earlier didn't  
19 think it was navigable, commercial or otherwise. I'm  
14:38:03 20 simply -- my opinion is reflecting what I found in the  
21 documents.

22 Q. Now, with all these documents and everything that  
23 you looked at -- it's kind of what I have classified in my  
24 own mind as the eyes of the beholder. And what I mean by  
38:48 25 that is when somebody wrote a letter in 1912 and said that



1 the river was not navigable, that was based on that person  
2 looking at the river in 1912 and saying, "Look, there is  
3 no water in it," right?

4 A. Right. But then this gets back to the issue of  
14:39:05 5 whether you're looking at that one document, and I think  
6 the Land Department made the same point, you need to  
7 consider the reliability of that document in the context  
8 of the entire universe of documents that surround it. So  
9 I would also examine that document, and if it was the only  
14:39:21 10 one that said that river is not navigable and all the  
11 others said it was navigable I'd probably discount it. On  
12 the other hand, if most of them said it is not navigable,  
13 that would tend to fit -- influence me to believe it was  
14 not navigable.

14:39:32 15 Q. I understand that. But what I am just trying to  
16 get at is that the documents that you looked at are  
17 colored by the time they were written, weren't they?

18 A. Yes.

19 Q. In other words, a person making a judgment about  
14:39:48 20 the Gila River today who didn't have any knowledge about  
21 these issues about whether we got to put the water back or  
22 everything like that would go down there and say, "Look,  
23 you idiots, that's nothing but a bunch of sand down there.  
24 You can't put a boat in it," right? That's not navigable.

40:03 25 Fair?

1 A. Is that a question?

2 Q. Is that a fair statement of what a person would  
3 say today, looking at the Gila River?

4 A. I haven't been down to the Gila River today. I  
14:40:10 5 don't know if there's water in it or not.

6 Q. In this year?

7 A. It would be a fair statement that whenever they  
8 looked at it, they were saying what they saw.

9 Q. Okay. And so in 1912, they saw a river that had  
14:40:25 10 been fully -- or at least very seriously depleted of  
11 water, fair?

12 A. I think there were a lot of diversions in place  
13 by 1912, yes.

14 Q. Okay. And weren't there a lot of diversions in  
14:40:40 15 place even by the first time that river was surveyed in  
16 1861?

17 A. I don't know the exact number of diversions;  
18 there may have been, I don't know.

19 Q. Did you do any research about the diversion of  
14:40:53 20 the Gila River at any time?

21 A. No.

22 Q. And so your reports don't take into consideration  
23 diversions, dams, that sort of stuff, drawing water out of  
24 the Gila River that might be replaced to make it  
41:16 25 navigable?

1 A. My report simply relates what parties on the  
2 scene thought or said or wrote about the Gila and whatever  
3 the circumstances were on that particular day as what the  
4 party observed.

14:41:24 5 Q. Do any of the reports and things that you have  
6 referred to talk about diversions of the Gila River?

7 A. As a matter of fact, if you want to go into a lot  
8 of detail, my discussion of the Desert Land Act patent  
9 that's in my report does deal with -- I believe it's 50  
14:41:48 10 different Desert Land Act homestead filings. And the  
11 requirement under that particular law was that diversions  
12 had to be made from a non-navigable body of water, and all  
13 of the parties in those patent applications cited sources  
14 that related to the Gila River.

14:42:04 15 Q. I was going to get to this later, but since you  
16 jumped right into it, I'll give you a copy of that act.

17 A. Thank you.

18 Q. All right. That's the whole Act in its original  
19 form, other than it's not on the original paper.

14:42:20 20 A. It would appear to be the original law.

21 Q. Now, let me get you a yellow marking pen. And  
22 I'd like you mark on that document where that Act says  
23 that diversion must come from a navigable river -- from a  
24 non-navigable, that you cannot get diversion from a  
42:48 25 navigable river. The specific language that says that.

1 MR. HESTAND: Mr. Chairman, I'd like to ask  
2 Mr. Helm to repeat that last verbiage that he just put out  
3 again. I had a little trouble following it.

4 MR. HELM: What he said?

14:43:19 5 MS. LIVESAY: No, what you just said, your  
6 last statement.

7 MR. HELM: He testified that the --

8 MR. HESTAND: You came back over here  
9 talking about the navigable, non-navigable and I

14:43:22 10 couldn't --

11 MR. HELM: What, the last one -- I told him  
12 that it was the original copy of the law except that it  
13 wasn't on the original paper.

14 COMMISSIONER ECHEVERRIA: No, you said  
14:43:34 15 something to the degree that you could not take -- you  
16 could not divert water from a non-navigable river. Is  
17 that what you said?

18 MR. HELM: Exactly. That's what his -- his  
19 testimony was that the water for the Desert Land Act could  
14:43:49 20 only be diverted from a non-navigable -- I'm paraphrasing.

21 I hope I'm not misstating what he said -- and I'm asking  
22 him to take the Desert Land Act, which sets that  
23 requirement, so that -- I want to know specifically what  
24 he's referring to in there and yellow line the language  
44:07 25 that he says that you can't divert water from a navigable

1 stream to perfect your rights under the Desert Land Act.

2 DR. LITTLEFIELD: That's not what I said.

3 BY MR. HELM:

4 Q. What did you say?

14:44:24

5 A. I said the Desert Land Act's requirement was that  
6 you had to irrigate the property in order to obtain your  
7 homestead.

8 Q. Uh-huh.

14:44:33

9 A. And the water had to come from a non- -- had to  
10 be an appropriation from a non-navigable body of water.

11 Q. I said I was paraphrasing you. I wasn't trying  
12 to say it word for word. The sum and substance of it  
13 is -- did you mark that of the portion that --

14:44:47

14 CHAIRMAN EISENHOWER: Mr. Helm, one little  
15 thing, our microphones don't travel quite as well as you  
16 do.

17 MR. HELM: I'll try and stay close.

18 CHAIRMAN EISENHOWER: If you would honor our  
19 microphones, please?

14:44:57

20 MR. HELM: Sure. I was seem to get the  
21 feeling that my voice is loud, and in court, they never  
22 worry about where I am because they can hear me.

23 BY MR. HELM:

45:17

24 Q. You have marked this language: Colon, "And all  
25 surplus water over and above such actual appropriation and

1 use together with the public land and not navigable shall  
2 remain and be held free for the appropriation and use of  
3 the public for irrigation, mining, manufacturing purposes  
4 subject to existing rights."

14:45:37 5                   That doesn't say that I must appropriate  
6 from a non-navigable stream, does it?

7           A.    The document says what it says.  It's my  
8 understanding that that's the implication of that  
9 statement.

14:45:50 10           Q.    That's your interpretation, correct?

11           A.    It's my understanding from what I have been told  
12 from a variety of historical sources that that's what it  
13 means.

14           Q.    Would you please list for me and the commission  
14:46:01 15 each historical source that you're referring to?

16           A.    I can't do that off the top of my head.

17           Q.    Did you ever hear of a guy named Joseph L. Sax?

18           A.    No, I haven't.

19           Q.    He and a guy named Abrams are a couple of lawyers  
14:46:17 20 who write a hornbook -- do you know what a hornbook is?

21           A.    I have a general idea.

22           Q.    -- called legal "Control of Water Resources Cases  
23 and Materials," fair enough?  And let's me read you a  
24 quote, see if you disagree with it.  It's from chapter 4,  
46:38 25 page 298 of the book.

1 "Then in 1977 Congress enacted the Desert  
2 Land Act, a sort of homestead law for arid western states.  
3 Among its provisions, which dealt mainly with disposition  
4 of land, was the following:" Quote, dot, dot, dot, "all  
14:47:00 5 surplus water over and above such actual appropriation and  
6 use" -- dot, dot, dot -- "upon the public land and not  
7 navigable shall remain and be held free for appropriation  
8 and use of the public for irrigation, mining, and  
9 manufacturing."

14:47:19 10 The good authors go on to say, "Whatever  
11 this statutory language may, on its face, suggest to you,  
12 it is virtually certain that Congress did not set to make  
13 a federal scheme of water law." Do you agree with that?

14 A. As a general matter?

14:47:38 15 Q. This is specific to the Desert Land Act.

16 A. I don't know who the authors are of that, and I don't  
17 know anything about their backgrounds.

18 Q. And you don't know whether it's an authoritative  
19 text or not?

14:47:50 20 A. No, I don't.

21 COMMISSIONER ECHEVERRIA: Excuse me,  
22 Counsel, but I think you mean 1874, don't you?

23 MR. HELM: 1877.

24 DR. LITTLEFIELD: You said 1977.

48:00 25 MR. HELM: I get them all mixed up, and

1 sometime I'll probably say 2007, I mean, you know. I  
2 fuzzy them up, but yes, I do mean 18- -- 1800s, I  
3 apologize.

4 BY MR. HELM:

14:48:19 5 Q. Now, do you recall a discussion that we had over  
6 whether travel by and of itself on a river could establish  
7 navigability?

8 A. I vaguely remember that we went over that in my  
9 deposition.

14:48:34 10 Q. And from your perspective, that wasn't enough,  
11 was it?

12 A. That's correct.

13 Q. Okay. If the case law says that travel is enough  
14 to establish -- and we obviously mean travel on the  
14:48:49 15 river -- is enough to establish navigability, is there  
16 evidence of such travel on Gila River?

17 A. I can't speak to case law because I'm not an  
18 attorney or a judge.

19 Q. I'm not asking you to.

14:49:03 20 A. Well, you did include that in your question so I  
21 just want to get that out of the way to begin with. I'm  
22 not speaking about case law.

23 There is evidence that there were boats used  
24 on the river. I think that's been pretty thoroughly  
49:15 25 covered by the State, also by Mr. August, and I believe



1 some of the other parties as well. There were instances  
2 of boating on the river; they were somewhat limited in  
3 number, though.

4 Q. So to the extent that you eliminated those as  
14:49:28 5 evidence of navigation, because you believe travel isn't  
6 enough, the commission should take that into consideration  
7 in reviewing your report if they believe travel is  
8 sufficient to establish navigation?

9 A. I didn't take them out of my consideration. In  
14:49:49 10 fact, I think you'll find they're discussed in my  
11 report -- or at least some of them. But this gets back to  
12 the same issue here. If you're selective about the  
13 particular documents or events, it's very easy to arrive  
14 at one conclusion. But if you look at all of --  
14:50:02 15 particularly just looking at the instances of boating,  
16 most of them weren't successful. And as a result, if you  
17 look at the larger forest instead of looking at the trees,  
18 what you're going to see is yes, there are some instances  
19 of boating on the river. I mentioned them in my report  
14:50:20 20 and described them.

21 But when you look at all the other documents  
22 that relate to the river, parties believing the river not  
23 to be navigable, the other instances so thoroughly  
24 overwhelm the handful of times that boats were on the  
50:33 25 river that I don't think it's a fair conclusion that most

1 people thought it was navigable.

2 Q. You said most of the boating was unsuccessful --  
3 or not successful, I believe, were your words. Define for  
4 me and the commission what you mean by the word  
14:50:50 5 "successful."

6 A. I mean --

7 Q. Does it get me from point A to B?

8 A. I'm talking about whether the parties involved  
9 believed it was successful or not.

14:50:58 10 Q. Not that the boat didn't get from point A to  
11 point B.

12 A. Some did, some didn't.

13 Q. So your characterization of not successful is,  
14 "Gee, I didn't get the laws down," not that "I wasn't able  
14:51:11 15 to take boat and go from point A to point B."

16 A. I'm just relating what the parties said they  
17 tried and what they accomplished or didn't accomplish.

18 Q. Buckey O'Neill got everything done he wanted to  
19 do, didn't he?

14:51:22 20 A. I don't remember him precisely. I believe I  
21 described him in my report.

22 Q. He's the "Yuma or Bust" fellows?

23 A. Weren't they the ones that were as happy as mud  
24 turtles pushing their boat?

51:34 25 Q. Absolutely.

1 A. I would say that maybe they were happy that they  
2 got there, but they wound up pushing their boat most of  
3 the way rather than riding in it.

4 Q. Where did you see that they pushed the boat most  
14:51:43 5 of the way?

6 A. Well, they pushed it part of the way.

7 Q. Okay.

8 A. I don't remember if it was most of the way or  
9 not.

14:51:49 10 Q. That might be a little bit of an overstatement,  
11 wouldn't it?

12 A. I do not know. I would have to go back to  
13 original document. I try not to take things out of  
14 context.

14:51:56 15 Q. At any rate, the boat got from A to B over the  
16 course of that river, didn't it?

17 A. Some of it being pushed, yeah, it did.

18 Q. Is a requirement of navigability that you can  
19 never get out of the boat and push?

14:52:13 20 A. I'm only relating what they said that they did.  
21 I guess it was really their opinion as to whether that was  
22 navigable or not.

23 Q. Well, if the goal was to get from A to B, it was  
24 successful, wasn't it?

52:24 25 A. I guess you could also push it across the floor

1 here, and if you said that was successful, that would be  
2 successful.

3 Q. If I was going from A to B on this floor, it  
4 would be successful.

14:52:33 5 A. If that's what you set out to do.

6 Q. At any rate, let's go on to a steamer that ran  
7 for seven years on some part of the Gila River, right?

8 A. I believe that's correct.

9 Q. Would that qualify as successful?

14:52:44 10 A. Depends on what the parties involved were  
11 attempting to do and whether they believed it was.

12 They -- my recollection of the steamer, which ran mostly  
13 on the lower portion of the Yuma, I believe it was below  
14 Dome, only ran a small number of times, and ultimately the  
14:53:01 15 attempt was abandoned anyway, so I don't know whether they  
16 viewed that as successful or not.

17 Q. Do you have any evidence that it only ran a small  
18 amount of times?

19 A. Other than the historical documents that discuss  
14:53:13 20 it that are in my report.

21 Q. So that's it. If it doesn't say "small amount of  
22 time" in those documents, that's your characterization,  
23 right?

24 A. My recollection of the documents that I either  
53:23 25 cite in my report or reviewed was that it was a small

1 number of times or short period of time.

2 Q. Let me read another quote. And I don't have this  
3 as tightly organized as I would have liked to, but back on  
4 the commercial issue.

14:53:52

5 "Question: I guess in terms of the  
6 terminology of your report, when you use  
7 the term "navigable," what we really should  
8 add then, shouldn't we, is commercially  
9 navigable."

14:54:04

10 And your answer is, "Correct."  
11 You made that statement, didn't you?

12 A. I'll take your word for it.

13 Q. That's at page 53-54 of the deposition.

14:54:28

14 Now, I think you told me in your deposition  
15 that your determination of navigability was tied to the  
16 date of statehood. And what I mean by that is that, for  
17 example, the kind of boats I'm going to consider in  
18 measuring whether it's navigable are the kind of boats  
19 that were being used around the time of statehood?

14:54:46

20 A. My understanding of what I was asked to do was to  
21 look at the navigability or lack thereof of the Gila  
22 between the confluence with the Salt and the juncture with  
23 the Colorado River prior to and at the time of statehood,  
24 which is what the title of the report says. And so in that  
25 context, part of what I would have looked at are the types

55:09

1 of watercraft that were commonly used then.

2 Q. Is it your opinion that in making a determination  
3 of navigability one is restricted to you looking at the  
4 types of watercraft that were used in and around  
14:55:29 5 statehood?

6 A. I think that's a legal question. I really don't  
7 know the answer to it.

8 Q. If one is not restricted to that, your report  
9 does not consider, for example, canoes?

14:55:43 10 A. I don't think they were mentioned in my report.

11 Q. Smaller boats of any kind, for the most part?

12 A. Well, I didn't --

13 Q. You get down to what's his name's Colorado -- the  
14 guy who did the Colorado the first time. I'm having a  
14:56:00 15 senior moment.

16 MR. MCGINNIS: Powell?

17 BY MR. HELM:

18 Q. Powell. You got his boat in there, right?

19 A. I mention his boat in my report, yes.

14:56:08 20 Q. Did you opine in your report whether Powell's  
21 boat could have floated on the Gila?

22 A. No, I did not.

23 Q. Could it have?

24 A. I have no idea.

56:18 25 Q. Do you know what kinds of boats could have been

1 used on the Gila at any time from 1850 to 1912?

2 A. What types of boats could have been used?

3 Q. Uh-huh.

4 A. All of them?

14:56:37 5 Q. Yes. Or start with one, and we will ask about  
6 another one.

7 A. I only have a general understanding of what  
8 watercraft were like at the time. The purpose of my  
9 report really was not to deal with -- primarily with  
14:56:50 10 watercraft other than to the effect -- other than to the  
11 extent that they related to some activity on the Gila  
12 River.

13 Q. Okay. All the discussion of the steamboats in  
14 your report, then, was related to the activity on the Gila  
14:57:04 15 River of steamboats using the lower Gila River around  
16 statehood?

17 A. I thought it was relevant to show what the nature  
18 of steamboats were at the time because there had been one  
19 on the lower Gila River.

14:57:21 20 Q. How much water do you recall a steamboat needed  
21 to use the Gila?

22 A. I believe that the description of some of those  
23 steamboats were a foot, possibly a little bit more than  
24 that, of draft. Maybe 2 feet. I don't remember exactly.

57:33 25 Q. Now, in that context, you mentioned that you

1 thought that they had gone to Dome. Do you or can you, as  
2 you stand here, point me to any historical document that  
3 would say that? That was the limit of the steamboat's  
4 travel?

14:57:51

5 A. The discussion in my report about the steamboat  
6 going up the Yuma River does name a particular place where  
7 ultimately the craft was abandoned and, I believe, washed  
8 into a sandbar and partially covered by the movement of  
9 the river. And I think it does identify that place. I

14:58:07

10 don't think it -- I may be remembering wrong, but I don't  
11 recall specifically whether other locations were mentioned  
12 other than the fact that it left from Yuma going upstream.

13 Q. That was on the Colorado River where it crashed  
14 and burned, wasn't it?

14:58:21

15 A. I'm not sure. I think the one on the Gila was  
16 different one than the one that you are thinking of,  
17 though.

14:58:34

18 Q. Are you referring to the occasion where -- the  
19 accounts that you have in your report talks about a  
20 steamboat coming out of the Gila and getting swept by the  
21 water it ran into coming down the Colorado and ending up  
22 somewhere down the Colorado tied to a tree and then the  
23 tree fell in the water?

58:53

24 A. I believe that's -- I believe that's a  
25 description. I don't recall precisely where the location



1 was.

2 Q. And the boat washed down farther and then it  
3 washed up on shore and then, gosh, it was a flood and the  
4 river moved so the boat was now six miles from the river  
14:59:05 5 or some distance that doomed it?

6 A. I don't think I was that detailed in my report,  
7 but I think you're talking about the same thing.

8 Q. Okay. My overdramatic description of it does  
9 refresh your memory, though?

14:59:24 10 A. I think it's a bit of an exaggeration.

11 COMMISSIONER ECHEVERRIA: Never.

12 BY MR. HELM:

13 Q. Is it fair to say that your study of the lower  
14 Gila -- if you let me use that phrase, from the confluence  
14:59:41 15 of the Salt -- didn't include any determination if any  
16 subset of that river could have been navigable in and of  
17 itself?

18 A. I didn't address that question directly. I just  
19 related what the historical parties said about certain  
14:59:55 20 parts of the river at certain times in the past.

21 Q. So if steamboat running for seven -- seven years  
22 up some distance of the Gila makes it navigable, you  
23 wouldn't have any opinion on whether that portion should  
24 be navigable on or not because parties acknowledged that  
25 00:15 steamboat ran up the Colorado?

1 A. I related what the steamboat did in my report.

2 Q. Now, we talked about Defenders of Wildlife case  
3 in your deposition because you had an opportunity as you  
4 sat there to read it, correct?

15:01:17 5 A. I believe that's what you said a moment ago.

6 Q. If you have any doubt about it, I can read you  
7 where you say that.

8 A. I'll take your word for it.

9 Q. In there, we talked about one of your opinions  
15:01:30 10 being that railroads and roads running parallel to a river  
11 would establish that the river was not navigable. And you  
12 agreed that that wasn't in accordance with the description  
13 of the Defenders case, fair enough?

14 A. I don't remember that. I don't believe I agreed  
15:01:54 15 that the mere presence of railroads indicated navigability  
16 or non-navigability. I said that when you looked in the  
17 larger picture of the historical record, it's one element  
18 to be considered as to whether there were alternative  
19 means of transportation.

15:02:10 20 Q. Let me read you your quote. Page 114 of the  
21 transcript.

22 "Question: That opinion that you  
23 hold about roads and railroads confirming  
24 non-navigability is not in accordance with  
02:23 25 the Defenders opinion, is it?

1 "Answer: The Defenders opinion?

2 "Question: The case that you just read.

3 "Answer: No, it's not."

4 Do you have any reason to believe that you  
15:02:42 5 didn't make that statement in your deposition?

6 A. No. If you say it's there, I guess it's there.

7 Q. I'd like to show it to you if you don't --

8 A. No. I believe you. If it says it's there, it's  
9 there.

15:03:04 10 Q. Let's talk about -- and I got to kind of run  
11 through your second report. These were the questions I  
12 had for you from before, but some will overlap, and  
13 therefore we'll get through this a lot quicker. So let's  
14 have at least a little chat about your thoughts on patents  
15:03:26 15 and what they show, okay?

16 A. Okay.

17 Q. I believe it's your conclusion that a federal  
18 land guy selling land would have put in the patent he gave  
19 to that land an exception for the lands that were under a  
15:03:48 20 navigable river. Is that fair?

21 A. No. What I said was that they didn't accept the  
22 land from the patent that they issued. I didn't say  
23 whether they would have or wouldn't have. I just said,  
24 "This is what they did." They didn't do it.

04:07 25 Q. Okay. Now, assume that the law says that if

1 you're the federal government and you are in prestatehood  
2 times deeding away a piece of ground, that deed does not  
3 convey title to any land under a navigable river unless it  
4 says it does.

15:04:39 5 A. I don't understand your question.

6 Q. Let me try it again. Assume that the law of the  
7 United States, either in statute or Supreme Court case law  
8 or lower court case law, says if an officer of the federal  
9 government, the man working in the land office, deeds away  
15:05:10 10 a piece of property owned by the federal government and  
11 includes in the legal description a river that is not  
12 navigable -- I'm sorry, a river that is navigable, that  
13 does not convey any title to lands underlying that  
14 navigable river, all right? Do you understand it now?

15:05:40 15 A. I believe that's a legal conclusion. I don't  
16 think I can answer that.

17 Q. I just want you to assume that that's the law.

18 A. Okay.

19 Q. Okay. I don't want you to tell me whether it is  
15:05:47 20 or not. I'm not asking you to tell me that. I'm telling  
21 you to assume that's the law. If that was the law, back  
22 when these 20 patents were issued that you talk about --

23 A. Actually, I think it's several hundred that I  
24 reviewed.

06:03 25 Q. Several hundred. Why would an officer of the

1 federal government need to accept from that deed those  
2 lands underlying the waters of a navigable water?

3 A. I'm only telling you what they did. I don't know  
4 why they did it. I believe that they were following  
15:06:24 5 whatever instructions they had at the time, which were the  
6 different homestead laws. And then they had  
7 administrative instructions about how to record -- accept  
8 the paperwork and record the filing of the patent.

9 Q. But the point being that they would be doing a  
15:06:41 10 somewhat needless act if it didn't convey title anyway?

11 A. I think it's purely speculative. I have no way  
12 of being able to answer that question. I'm a historian.  
13 I tell you what's there. I don't tell --

14 Q. You didn't get any advice from your counsel or  
15:06:58 15 anybody else or read any cases or check any statutes that  
16 told you what the law was on title to lands under rivers  
17 in preparation for doing your report?

18 A. No. As a matter of fact, I didn't.

19 Q. So the assumptions and conclusions that you draw  
15:07:18 20 as to what that patent tells us are your assumptions and  
21 your conclusions?

22 A. No. They're what the patents say and the patent  
23 files say. The documents say what they say, and I relate  
24 that in my report.

15:07:30 25 Q. But how does that get you to non-navigability?

1 They don't say the river is not navigable.

2 A. It is a reflection on the part of individuals at  
3 the time as to what they thought they were granting title  
4 to. And to the extent that that has some bearing on title  
15:07:49 5 to the beds of the river, to me, it seemed to be relevant  
6 because it's property that's along the river.

7 Q. If I know I'm not going to -- that the law says  
8 I'm not conveying that property to you, why do I need to  
9 have to write it in a deed?

15:08:04 10 A. I don't know the answer to your question. I'm  
11 just telling you what's in the patent files. And I have  
12 reviewed several hundred of the applicant files, their  
13 witnesses' supporting documents, court filings that are in  
14 those papers, the actual deeds themselves, testimony by  
15:08:20 15 claimants. I'm just telling you what is in those  
16 documents.

17 Q. Was there any requirement in federal law or any  
18 document that you reviewed that said, "Officer of the  
19 federal government, you must, when conveying a patent from  
15:08:38 20 the United States prior to statehood, except out the lands  
21 that are under a navigable waterway"?

22 A. If there had been such a instruction, I would  
23 have included it.

24 Q. In your report -- I can't remember all the  
09:11 25 places, but one anyway being 70-71, you talk about violent

1 and erratic river. And I'm not sure whether it's -- it's  
2 got to be first report that I'm talking about since I  
3 didn't have that one when I prepared.

4 A. I don't think it's on my version of 70 and 71.

15:09:29 5 Q. On your original report?

6 A. If you say so.

7 Q. I do.

8 Okay. And I asked you about that language,  
9 and you told me that that was a reference to the Gila

15:09:43 10 River in flood stage?

11 A. That's what one of the parties stated the river  
12 was like.

13 Q. Okay. In flood stage?

14 A. Yes.

15:09:50 15 Q. Okay. Did you do any research to determine how  
16 much on average of a year, let's say, from 1850 to 1912  
17 the Gila River was in flood stage?

18 A. No.

19 Q. Now, all the patents that you discuss in both  
15:10:15 20 your first and second report are discussions about patents  
21 that were issued after diversions had taken place on the  
22 Gila River?

23 A. That's correct. I believe that not all of them  
24 were, there some issued before and some after.

10:34 25 Q. It grew and grew and grew as time went on, but

1 when you get to some of your later dated patents I think  
2 we were up past -- 20 years past statehood.

3 A. Yes.

4 Q. Somewhere in that neighborhood?

15:10:42

5 A. Yes.

6 Q. I mean, that river is totally diverted, isn't it?

7 A. I don't know the exact diversion appropriation  
8 filings or how much is diverted or not diverted at any  
9 particular point in time.

15:10:55

10 Q. With respect to --

11 CHAIRMAN EISENHOWER: Mr. Helm?

12 BY MR. HELM:

13 Q. With respect to the patents that you reviewed  
14 that were issued after statehood, if that -- federal

15:11:07

15 patents issued after statehood -- if that was a navigable  
16 stream, the federal government wouldn't have had anything  
17 to convey, would they?

18 A. I don't know whether they would or not. I just  
19 related what was in the patent file and the application.

15:11:26

20 Q. Would you agree with me that the federal  
21 government lost all title to the rivers under navigable  
22 waterways on the day of statehood?

23 A. I think that's a legal conclusion. That's part  
24 of what I think the commission is to diagnose here.

11:32

25 Q. Do you dispute that as being the law?



1           A.    I can't answer your question, it's a legal  
2 conclusion.

3           Q.    All the contemporaneous observers that you talked  
4 about did not view the Gila River in its ordinary and  
15:11:55 5 natural condition, did they?

6           A.    Meaning what?

7           Q.    Ordinary and natural, prior to any diversions  
8 taking place on the river done by man.  "Man" being  
9 western man?

15:12:08 10           A.    I believe all the parties that I discuss, with  
11 the possible exception of some of the Spanish explorers,  
12 were -- and maybe some of the early military explorations  
13 too -- I think they may have been here prior to Anglo  
14 diversions, but I think the bulk of the parties that I  
15:12:29 15 discuss were at around the time of the beginning of  
16 diversions and as those diversions increased.

17           Q.    There's nothing contained in your report that  
18 would lead us to be able to figure out what the river  
19 would have been like if those diversions hadn't been made,  
15:12:45 20 is there?

21           A.    There are descriptions by some of the Spanish  
22 explorers that I mentioned in my report and some of the  
23 military expeditions.  The way they saw the river at  
24 certain times without -- without Anglo-American  
12:59 25 diversions, there may have been diversions by the various

1 tribes along the river.

2 Q. Those aren't normal and natural either, are they?

3 A. I guess that depends on your definition of  
4 "normal and natural." They were there by virtue of human  
15:13:12 5 activity, if that's what you mean.

6 Q. Exactly. I will -- I'll take that.

7 Now, in doing your work, did you look at the  
8 USGS water maps prior to making any conclusions about  
9 navigability?

15:13:27 10 A. I'm not sure which maps you mean.

11 Q. The United States Geological Survey water maps.

12 A. You mean today's maps?

13 Q. The ones that they -- they've been doing them  
14 since -- I can tell you in about two seconds if you want  
15:13:37 15 me to ask Lynn -- but well before statehood in Arizona.

16 A. The sources I cited are either discussed directly  
17 in the text or there is approximately 75 or 100 pages of  
18 appendices that list all the sources that I also looked at  
19 and, if they are in those appendices, then I looked to  
15:14:00 20 them.

21 Q. Let me refresh your recollection.

22 A. Okay.

23 Q. Page 139 of your deposition.

24 "Question: Did you look at any USGS  
14:07 25 or other water maps in making your conclusion?

1 "The water maps themselves?

2 "Yes.

3 "Answer: No, I did not."

4 A. I think I was probably confused about what you're  
15:14:15 5 asking. I'm not sure even know if you're asking about the  
6 current USGS topo maps or if this is some other type of  
7 map.

8 Q. Doctor, did you have a opportunity to review that  
9 deposition?

10 A. Not since -- I read it shortly after it was  
11 taken, but I haven't read it since then.

12 Q. Were you confused when you read it?

13 A. I don't remember.

14 Q. You had an opportunity to write, "I'm confused.  
15:14:37 15 This question is confusing," when you reviewed it, if you  
16 wanted to, didn't you?

17 A. Yes, I did.

18 Q. You didn't do that, did you?

19 A. As I said, I haven't read the deposition so I  
15:14:47 20 don't know.

21 Q. You don't recall making any corrections to it?

22 A. Not that I recall.

23 Q. Do you accept the USGS water maps and Bureau of  
24 Reclamation maps as authoritative?

15:03 25 A. Don't recall using the USGS water maps. In

1 general, I think the USGS records and Bureau of  
2 Reclamation records are accurate for what they are set  
3 forth -- attempting to do.

4 Q. Do you agree that if I could use the river for  
15:15:32 5 some period of time, even in flood stage, it could be  
6 navigable?

7 A. I think that's a legal conclusion. I can't  
8 answer your question.

9 Q. You have no idea?

15:15:44 10 A. It would depend on what your standard is and what  
11 you're trying to do and who's asking and why they're  
12 asking and under what legal definition. In my view, it's  
13 not very specific.

14 Q. Did you come across any accounts of anybody using  
15:15:59 15 the river in any heightened stage of flow?

16 A. Meaning in a flood?

17 Q. Heightened stage of flow.

18 A. I don't remember precisely.

19 Q. We have a funny problem in Arizona defining  
15:16:16 20 floods sometimes, because currently if there's water in  
21 the Salt River, you'll find a lot of people who will say,  
22 "That's a flood." So that's why I use the word heightened  
23 state of flow.

24 A. I don't recall.

16:29 25 Q. There were a lot of ferries that were there, at

1 least under your view, because of floods?

2 A. Well, not because of floods, but because they are  
3 needed for getting across water in the river. I don't  
4 know about floods.

15:16:42 5 Q. If it was dry, you didn't need a ferry?

6 A. Correct.

7 Q. At the time that I took your deposition, do you  
8 recall telling me that you were not aware that the Gila  
9 River in modern times had been used for boating and float  
10 trips and that sort of stuff?  
15:17:06

11 A. Even to today, other than what testimony has been  
12 presented here, I don't know anything about the modern use  
13 of the river for boating.

14 Q. Do you recall telling me that the difficulty of  
15 navigation doesn't disqualify a river from becoming  
16 navigable?  
15:17:36

17 A. I don't recall that precise statement. If I said  
18 it in my deposition, then it's in my deposition.

19 Q. I will tell you it is at page 155. You don't  
20 disagree with that?  
15:17:56

21 A. I don't disagree that it's there.

22 Q. For example, the Colorado is a navigable river,  
23 at least if you thought about Mr. Powell, he had a little  
24 difficulty getting through there?

18:08 25 A. Correct.

1 Q. Now, in your report, you characterized boat trips  
2 as novelty items, fair?

3 A. Yes, I have.

4 Q. I think you used the word "novelty" at one point.

15:18:27 5 A. That would be fair.

6 Q. Now, just because it's a novelty, doesn't mean it  
7 didn't happen, does it?

8 A. That's correct.

9 Q. It may be unusual, but if I got a boat from point  
15:18:42 10 A to point B, I have navigated between point A and  
11 point B, haven't I?

12 A. Yes, you have.

13 Q. If I did that on the Gila River, on whatever  
14 stretch that would be, that would mean that I have  
15:19:02 15 navigated the Gila River from point A to point B, fair?

16 A. That's correct.

17 Q. To the extent that boating took place on the Gila  
18 River, what does that say about the susceptibility of the  
19 Gila River to navigation?

15:19:38 20 A. I think that's a legal conclusion. I simply  
21 pointed out that there were instances where parties had to  
22 have boats on the river and at least under those  
23 circumstances, it was susceptible for those parties,  
24 either not successfully or successfully, depending on what  
19:56 25 they did.

1 Q. To the extent that we went from point A to point  
2 B, that would indicate the Gila River was susceptible to  
3 navigation by a boat?

4 A. That's a legal conclusion. I can't answer that.

15:20:41

5 Q. Let me read you another quote from your  
6 deposition, this occurs on page 163.

7 "Based on that case" -- I'm referring  
8 to the Defenders case -- "are there certain  
9 portions of your report that don't comply  
10 with the standards set out in that case?"

15:20:55

11 "Answer: You mean the descriptions  
12 of the contemporaneous observers?"

13 "Question: Well, for example, the idea  
14 of having to have the use of the river be  
15 of a commercial nature measured by the  
16 nature of watercraft in use in 1912 or  
17 thereabouts.

15:21:10

18 "Answer: Yes, that's correct."

19 You disagree with that statement now?

15:21:25

20 A. I'm not sure what your question is.

21 Q. I just -- you made that statement in your  
22 deposition, do you disagree with it?

23 A. I don't remember what's in the Defenders case so  
24 I don't know whether I currently disagree with it.

21:40

25 Q. You don't have any reason to believe that what

1 you said there should be changed at this point?

2 A. I don't remember what's in the case so I can't  
3 give you an opinion on that.

4 Q. Do you have any opinion of the navigability of  
15:21:58 5 the Gila River if man-made obstructions are removed?

6 A. No, I don't.

7 Q. Did you ever attempt to compare the Bureau of  
8 Reclamation or USGS records of flow of against what the  
9 surveyors indicated in their notes the river looked like?

15:22:24 10 A. My recollection is that, at least for some of  
11 those surveys, they were done a long time before --  
12 certainly before the Bureau, the Bureau didn't exist  
13 before 1902. And I think some of the other surveys were  
14 done quite a bit before any USGS records were done too.

15:22:41 15 So the short answer to your question is no, I didn't  
16 compare them.

17 Q. And just one follow-up question on that. But  
18 those records have been available for an extremely long  
19 time, particularly to some of the surveys that you've  
15:22:59 20 indicated were done in 1912 or thereafter?

21 A. Those records are largely engineering records,  
22 and I don't feel that I'm qualified to use them.

23 Q. Okay. Now, Doctor, one question that might get  
24 me along quite a ways. Do we have listed in the appendix  
23:26 25 to your most recent report all of the documents that you



1 are relying on for the statements contained in that  
2 report?

3 A. The appendices list, to the best of my  
4 recollection, everything that I looked at. The documents  
15:23:40 5 that I relied on I tried rather specifically to indicate  
6 in the footnotes. So I didn't want to be put in the  
7 position of putting words on the paper that weren't  
8 documented by a particular document. So the footnotes  
9 tell you which ones my report discusses and then the  
15:24:01 10 appendices tell you which -- either in some cases there  
11 are specific documents, such as titles of reports, and in  
12 other cases, there are collections of documents, such as  
13 files and archives, and that type of thing. The  
14 appendices tell you what I looked at but not necessarily  
15:24:15 15 what wound up in my report.

16 Q. In sum and substance, if we look at both, we got  
17 everything. That's all I want to know. Do I have to look  
18 anywhere else?

19 A. I think that's pretty accurate. I don't know  
15:24:26 20 that I cited the photos that I put in the recent report,  
21 but those are identified in the captions.

22 Q. On page 2 of your current report, you have a  
23 little discussion about the equal footing doctrine.

24 A. Yes.

25 Q. Historically speaking, could the standard be

1 different for two states for determining what a navigable  
2 river was?

3 A. I believe my understanding is that the -- one of  
4 the controlling factors is the date of statehood, and I  
15:25:33 5 think I indicated that in my report. It depends on when  
6 the state came into the union.

7 Q. So if the state comes into the union, for  
8 example, like Arizona -- and let me exaggerate a little  
9 bit -- the original Queen Mary was in the river. We've  
15:25:51 10 got to use the Queen Mary to test the navigability of our  
11 rivers, whereas the state of Massachusetts, which was a  
12 colony and tested its rivers with a canoe, gets to have  
13 its rivers determined for navigability with the canoe?

14 A. I think that's a legal conclusion. I can't  
15:26:10 15 answer that for you.

16 Q. That wouldn't be equal, would it?

17 A. It's equal to the extent that they are both  
18 relying on the date of statehood of their respective  
19 state.

15:26:25 20 Q. The methods to determine that equality wouldn't  
21 be equal, would it?

22 A. That's beyond the scope of my training. The  
23 equal footing doctrine, the way I understand it, is a  
24 reference to the date of statehood and what the test is  
25:26:38 25 beyond that is a legal determination.

1 Q. You have no idea whether the tests should be  
2 equal for all states?

3 A. Beyond what I have explained now, no, I don't.

4 Q. And to the extent that there may be some language  
15:26:56 5 contained in your report dealing with the equal footing,  
6 as you stated here, you don't have an awful lot of  
7 knowledge of that, you think that's a legal problem?

8 A. I believe I explained that question just a minute  
9 ago.

15:27:17 10 Q. Tell me what happens -- first, let me back up.

11 You would agree with me that there are  
12 watercourses throughout the United States -- one  
13 particularly comes to mind in Alaska -- that were  
14 determined to be navigable after that state became a  
15:27:32 15 union -- came into the union?

16 A. I have a vague recollection that there was a  
17 court case. I believe it was a U.S. appellate court case  
18 that dealt with the lakes in Alaska, but I really don't  
19 remember the specifics or the legal issues or anything  
15:27:47 20 else about it.

21 Q. Well, assume that that's the case, okay? Because  
22 I know it is, and so I'm comfortable giving you this  
23 assumption. And assuming that, tell me what happens to  
24 the lands that are determined to be -- are under a  
25: 28:05 25 navigable water that the determination is made after

1 statehood?

2 A. I have no idea.

3 Q. Do you know whether they go to the state or  
4 whether the owner of the land that's got the deed for them  
15:28:17 5 gets it?

6 A. I have no idea.

7 Q. Okay. You don't know whether those lands would  
8 appear on a patent?

9 A. No, I don't.

15:28:25 10 Q. It would be unlikely, wouldn't it?

11 A. I have no idea.

12 Q. Wouldn't have been known to be navigable at the  
13 date of statehood?

14 A. I haven't investigated that particular issue.

15:28:36 15 CHAIRMAN EISENHOWER: Mr. Helm, are you at a  
16 convenient break point?

17 MR. HELM: Whenever you'd like.

18 CHAIRMAN EISENHOWER: I think we'll give our  
19 court reporter a break for his fingers, so we'll take a  
15:28:53 20 few minutes.

21 (A recess ensued.)

22 CHAIRMAN EISENHOWER: Okay. We're ready to  
23 go back. Let us reconvene again.

24 And, John, if you will, would you wrap it up  
42:08 25 in about 15, 20 minutes so that we -- we've got two

1 witnesses -- we have two other witnesses from out of town  
2 that wish to speak and it's quarter to four already.

3 MR. HELM: I'll give it my best shot. I  
4 understand where you're coming from, but I've got a record  
15:42:17 5 that's got to go up to a court. And if I don't get it in,  
6 it doesn't go up to the court. In all deepest respect for  
7 you guys, I don't want to be here either. I would rather  
8 go home and eat dinner. But I've got a job to do, and  
9 I'll try -- I've eliminated half of it. I've already cut  
15:42:39 10 an hour out of it. I have to -- and I'm still eliminating  
11 because some of it I have covered, but I have to get  
12 through his report.

13 CHAIRMAN EISENHOWER: I know. But some of  
14 the questions seem like they've become repetitive.

15:42:47 15 MR. HELM: I'll try to avoid those as best I  
16 can. I'm just not organized because I'd only had this  
17 for -- I had to do it in the margins, not on nice little  
18 legal sheets where I could --

19 CHAIRMAN EISENHOWER: If you would move it  
15:42:59 20 along rather rapidly because we're --

21 (Dr. Littlefield is answering questions.)

22 BY MR. HELM:

23 Q. I take it that you would consider whether travel  
24 was necessary to be navigable to be a legal question and  
43:22 25 you would have no opinion on it?

1 A. That's correct.

2 Q. Same for what kind of watercraft we should use to  
3 judge navigability?

4 A. Yes, that's correct.

15:44:30 5 Q. Are you sure? On page 56, you state that the  
6 USGS didn't start mapping until 1912. Are you sure of  
7 that?

8 A. Page 56 of what? The current one?

9 Q. Your second report.

15:44:47 10 A. Are you talking about the middle paragraph in  
11 that report under subheading A?

12 Q. I'm talking about -- yes, the thing starts "The  
13 U.S. Geological Survey ..."

14 A. To the best of my knowledge, they did not  
15:45:10 15 undertake any topographic surveys of the Gila River region  
16 prior to 1912.

17 Q. Okay.

18 A. There were some early quadrangles that were done,  
19 but those were post-1912. If there were earlier ones, I'm  
15:45:22 20 not aware of them.

21 Q. That's just with respect to topographic mapping,  
22 not any other kind of mapping, i.e., water mapping?

23 A. Yes, it's with regard to the topographic maps of  
24 scale 1:24,000 and 1:100,000.

15:45:43 25 Q. Now, at page 57 of your report, you talk about

1 comparing various survey plats to indicate that the  
2 channel had moved around a lot.

3 A. Yes.

4 Q. How does channel movement affect the ability to  
15:46:02 5 navigate?

6 A. It's one of the elements that I would look at on  
7 the assumption that if you don't have a reliable channel  
8 to bring a boat up, then it's not -- probably not going to  
9 be navigable. And I think Dr. Schumm talked about that  
15:46:30 10 and several of the other parties as well.

11 Q. Assuming all things equal in terms of depth,  
12 width -- I mean, the channel moves a mile to the West, but  
13 it's reasonably dimensional -- reasonably to the one  
14 before, how would that impair navigability? The first guy  
15:46:50 15 down there would be able to look up and say, "Hey, we're a  
16 mile to west," but his boat would still be going, wouldn't  
17 it?

18 A. Right. And I put the information in because I  
19 thought it was what contemporaneous observers -- what they  
15:47:09 20 were saying about the nature of the channel, and I wanted  
21 to include as many observations about the river as  
22 possible. I thought it had some relevance to the issue of  
23 navigability.

24 Q. But it's not an opinion that you're expressing on  
15:47:17 25 the inability to navigate just because the channel moves?

1 A. No, it's part of this larger picture that I keep  
2 bringing you back to, that you need to look at the overall  
3 impact of the historical record.

15:47:41

4 Q. Would you agree with me that once I know the  
5 corners of a township, for example, I don't need to survey  
6 any more of that township to write legal descriptions for  
7 sections?

15:48:03

8 A. I don't think so, no. As I already testified,  
9 I'm not a surveyor. But I think the more detail you could  
10 provide about subdivisions, the fractional portions of a  
11 section, the better your legal descriptions are going to  
12 be.

15:48:22

13 Q. Doctor, please, listen to my question. Would you  
14 agree with me that once I know the exposure points of a  
15 township that has been surveyed, that I can write the  
16 legal descriptions for the sections within that township  
17 without having to presurvey them?

18 A. I think you could make an estimation of it. It  
19 seems reasonable to me.

15:48:42

20 Q. One mile east, one mile south, one mile west,  
21 one mile north, right?

22 A. Right.

48:58

23 Q. All from a point located at such and such with a  
24 degree and a thing and by putting in an appropriate enough  
25 person who is familiar with that lingo can do it?



1 A. Well, the townships are 36 sections, not  
2 one mile --

3 Q. I was just using that as an example.

4 A. -- just use six miles each way.

15:49:12 5 Q. Sure. I don't mean that to be --

6 A. Yeah.

7 Q. What you have to survey for is to locate where  
8 that legal description is, right?

9 A. And the other purpose of the survey was to  
15:49:24 10 identify the characteristics of the land through which the  
11 survey was being done.

12 Q. That may be a purpose of those surveys, but I'm  
13 just talking generally about surveys.

14 A. Yes.

15:49:39 15 Q. And so in terms of patents, particularly patents  
16 in the early west, once I had -- what do we call it, the  
17 cadastral survey?

18 A. Cadastral.

19 Q. The one that does the townships. Once I had  
15:49:51 20 that, if I was so inclined, I could have been started off  
21 merrily selling sections of land, couldn't I?

22 A. I don't know how to answer that question. You  
23 can provide a description of the land involved.

24 Q. And then we could find where it was later, right?

50:13 25 A. Yes.

1 Q. Now, at page 64, you state, "However, the patents  
2 which appear on these exhibits are representative of  
3 settlement patterns throughout the Gila River Basin below  
4 the Salt River." And my question is, I'd like to know how  
15:50:39 5 you know that?

6 A. I looked at -- had obtained all the original  
7 patents for lands in sections through which the river  
8 flowed from the Salt River down to the Colorado River. I  
9 obtained all of those patents. I also obtained all of the  
15:50:58 10 patent files that relate to those patents, they come from  
11 two different sources. Patents come from BLM in Phoenix  
12 and the patent files you get at the National Archives.

13 What I mean by settlement patterns, as I  
14 explained in my direct testimony, was that I knew from the  
15:51:17 15 sheer length of the river I was not going to be able to  
16 discuss every single patent along the entire river. And I  
17 wanted to get a good sampling where there were relatively  
18 large numbers of patents so I would be able to say  
19 something a little bit more concrete about those samples.  
15:51:39 20 But I did look at all the patents and all of the patent  
21 files and nothing conflicts with anything I presented in  
22 my report.

23 Q. Did you do a statistical analysis of these  
24 patents that you used as they relate to all of the patents  
51:56 25 to determine whether that is -- what you're stating and

1 what you reviewed was statistically significant?

2 A. I didn't do a statistical analysis, but I don't  
3 think you needed to.

4 Q. That's good enough. I just asked if you did --

15:52:12 5 A. I'd like to answer your question, if I might.

6 Q. The question was did you do it, and the answer is  
7 yes or no.

8 A. I think it needs clarification, if you don't  
9 mind.

15:52:14 10 Q. Well, you've got a fellow over here who will be  
11 very happy to --

12 MR. MCGINNIS: We've been here for  
13 four hours. I think you can indulge him and let him  
14 answer the question.

15:52:28 15 CHAIRMAN EISENHOWER: Go ahead.

16 DR. LITTLEFIELD: I think if you look at  
17 the -- what are known as the master title plats and the  
18 historical indices, which identify how the U.S. government  
19 disposed of the public domain or otherwise encumbered it,  
15:52:44 20 you could count up without using a statistical analysis  
21 which townships had more homestead patents in them in  
22 certain times than others, and that's what I did.

23 BY MR. HELM:

24 Q. And so how many did you look at as compared to  
52:58 25 how many there were?

1 A. I don't know exactly. I looked at several  
2 hundred of them total. I don't remember the exact number.

3 Q. So did you look at all of them or just several  
4 hundred?

15:53:14 5 A. I looked at all of the ones that were in the  
6 sections that either the river flowed through directly or  
7 that was immediately adjacent to.

8 Q. Okay. So you didn't look at all of them?

9 A. All of them with that qualification. If the  
15:53:20 10 river went through it or was near it.

11 Q. Did you state that in your testimony earlier?

12 A. I believe it's in my report.

13 Q. On page 65 of your report you state, "The acreage  
14 is significant because if the Gila River had been  
15:53:50 15 considered navigable, federal officials presumably would  
16 not have granted title to any land through which the river  
17 flowed." Whose presumption are we talking about there?

18 A. Well, I have looked at other rivers for navigable  
19 purposes. And some of those rivers have, in fact, been  
15:54:13 20 navigable by pretty much any reasonable standard. And  
21 titles to the bed were -- to patents that were immediately  
22 adjacent to the river did not convey title to the river.

23 Q. Doctor, I asked you whose presumption that was.  
24 We really are going to be here till 12 o'clock tonight if  
54:31 25 you won't answer my question, okay? Whose presumption was

1 it you're referring to?

2 A. I'm assuming that if the land granting office had  
3 known it was navigable and understood the applications of  
4 that with respect to state title, they wouldn't have  
15:54:47 5 granted title.

6 Q. And that's your assumption?

7 A. Yes.

8 Q. Do you have any document that backs up that  
9 assumption?

15:54:59 10 A. Other than my experience in -- on other rivers in  
11 the west, no, I don't have one right here.

12 Q. Is it your testimony that the federal government  
13 has never issued a land patent that didn't include a legal  
14 description that covered navigable lands?

15:55:22 15 A. I don't know the answer to that.

16 Q. You'll probably tell me this is a legal question  
17 and you don't have an answer, but I got to ask it anyway  
18 so we can at least get on the record that you don't have  
19 any opinion.

15:56:01 20 What is the effect of general law of the  
21 United States on a issued patent?

22 A. That's a legal question, and I can't answer it.

23 Q. Okay. Have you ever heard of the concept that  
24 incorporated in the documents that a government issues are  
56:17 25 its laws?

1 A. No, I haven't.

2 Q. Now, Doctor, you talk about patents -- and I'm  
3 just looking here. I'm not sure, but I think this is the  
4 latest date, 1952, right?

15:56:58 5 A. I don't remotely recall.

6 Q. Woods-Harrelson patent file?

7 A. If you say so. I don't recall.

8 Q. Page 70 of your report?

9 A. Who is the party that you're talking about?

15:57:22 10 Q. Woods-Harrelson patent file, the last paragraph  
11 on the page.

12 A. Yes, I see that.

13 Q. Okay. That's dated 1952, correct?

14 A. Correct.

15:57:32 15 Q. I take it by that, that you would find it  
16 historically appropriate to look at a span of time, when  
17 deciding what was navigable, of 40 years at least on each  
18 side of the date of statehood?

19 A. What I should do is explain that because this was  
15:57:50 20 a particular exhibit that I had on those blow-up maps, and  
21 I was discussing some of the other patents that were much  
22 earlier in that township, I thought I had an obligation to  
23 discuss all of them, or at least to consider them in what  
24 I wrote so that I wasn't leaving something out.

58:11 25 Q. Well, on page 69, you talk about patents in 1931,

1 don't you?

2 A. Yes, that's correct.

3 Q. All I'm trying to find out is, is it appropriate  
4 to look at things that happened 40 years after statehood  
15:58:22 5 to determine whether a river is navigable at statehood?

6 A. I think it's appropriate to provide you with them  
7 and --

8 Q. And let the commission make the --

9 A. Decision, correct.

15:58:32 10 Q. It's appropriate evidence?

11 A. Yes.

12 Q. I take it that you would admit that you are not  
13 an expert in either Arizona groundwater law or Arizona  
14 surface law?

15:59:48 15 A. That's correct. I'm not an expert in either one.

16 Q. Now, you talk about Hefley's file, page 77 of  
17 your report?

18 A. I'm sorry, page 77, but I didn't hear the part?

19 Q. Hefley, I believe, is the fellow's name. I could  
16:00:22 20 be mispronouncing.

21 This is in regard to the appropriation of  
22 water from the Gila River?

23 A. Yes.

24 Q. And if I've got this right, June 11th, 1946 is  
00:42 25 when we're talking about?

1 A. That's that date that an examiner from the  
2 Department of Interior's grazing service submitted a  
3 report about the patent.

4 Q. That's roughly when he's seeking the patent in  
16:01:02 5 terms of the year 1946?

6 A. He declared his intent to seek the patent in  
7 1945.

8 Q. Fair enough.

9 In 1945, Mr. Hefley could not, under the  
16:01:20 10 laws of the State of Arizona, as far as you know -- or do  
11 you know if Mr. Hefley, under the laws of the State of  
12 Arizona, could have appropriated water from the Gila River  
13 in 1945?

14 A. I don't know the answer to that question.

16:01:36 15 Q. If he could not have, then would this discussion  
16 have any significance in terms of whether the Gila River  
17 was navigable?

18 A. Yes. It would to the extent that it reflects  
19 what the parties thought they were doing. Even if  
16:01:54 20 Mr. Hefley was mistaken, it still reflects what he thought  
21 or wanted to do and what he considered to be the situation  
22 involving the parcel he was interested in.

23 Q. But you wouldn't have expected to see him be able  
24 to have irrigation rights of the Gila River if you  
02:15 25 couldn't get one, would you?



1           A.    I don't know anything about what it took to get a  
2 right in 1946.

3                   CHAIRMAN EISENHOWER:  Mr. Helm, are you  
4 prepared to put your other two witnesses on right now?

16:02:27 5                   MR. HELM:  I can if you want.

6                   CHAIRMAN EISENHOWER:  I would like to do  
7 that right now, please.

8                   MR. HELM:  Sure.  I need to get their  
9 thing, and we need to get hooked up.

16:02:36 10                  CHAIRMAN EISENHOWER:  I'd be happy to --

11                  MR. HELM:  I'm not done so I don't know what  
12 we're going to do.

13                  MR. MCGINNIS:  Are you cutting him off?  
14 Because we have some other people I don't think we have  
15 any cross and some redirect, I think, on Littlefield.

16:02:48

16                  CHAIRMAN EISENHOWER:  Well, what want I to  
17 do is get those two people on so that part is done.  And  
18 if we have to bring Mr. Helm back, we'll bring him back.  
19 But you know, I think --

16:03:03

20                  MR. HELM:  It might help because I'll be  
21 able to eliminate some questions here, quite frankly,  
22 because like I said, I had to write these in the margins  
23 because of the time frame and so I --

03:13

24                  CHAIRMAN EISENHOWER:  You think your two  
25 witnesses will alleviate some of your questions?

1 MR. HELM: I don't know that alleviate -- it  
2 might eliminate them.

3 CHAIRMAN EISENHOWER: Eliminate them, fine.

4 MR. MCGINNIS: I guess I don't see the logic  
16:03:25 5 of stopping him now and then starting back later.

6 CHAIRMAN EISENHOWER: How long are you going  
7 to go?

8 MR. MCGINNIS: You told him 20 minutes, 15  
9 minutes.

16:03:30 10 CHAIRMAN EISENHOWER: Yeah, I know, that's  
11 what I mean.

12 MR. HELM: How long am I going to go?  
13 That's his report as you can see from going up here,  
14 that's page 78, so I've gone through 78 pages of his  
16:03:45 15 report. His report is 136 pages long, so more than  
16 halfway through it, and I've done that in half an hour.

17 CHAIRMAN EISENHOWER: Let's expedite it,  
18 please.

19 MR. HELM: I'm trying.

16:03:58 20 CHAIRMAN EISENHOWER: Please.

21 MR. HELM: We need to set up for a second,  
22 hook up the computer and get that all --

23 CHAIRMAN EISENHOWER: No, go ahead and get  
24 yours done so -- I want to finish -- we're going to finish  
04:15 25 this up tonight.

1 MR. HELM: I can stay here as long as you  
2 want.

3 CHAIRMAN EISENHOWER: Well, we're not going  
4 to stay here as long as you want, I guarantee. Because we  
16:04:19 5 want evidence for our purposes; you know, you have another  
6 reason and I understand that reason. But we're trying to  
7 bring evidence before this commission so that we can make  
8 a qualified judgment. And I would like you to expedite  
9 your questioning and -- so we can move on to your two  
16:04:45 10 witness. And we have some -- a couple of other witnesses  
11 behind that.

12 MR. HELM: I understand that, Mr. Chairman.  
13 But the problem that I'm faced with is that what you do  
14 here today -- what you do can effect the Gila River for  
16:05:01 15 time immemorial. And we have to have a fair opportunity  
16 to cross-examine. That's guaranteed by the Constitution  
17 of the United States, it's part the due process clause.  
18 I'm hurrying just as fast as I can. Like I say, when I  
19 took his deposition, it took two, three days -- I don't  
16:05:22 20 remember. It wasn't --

21 CHAIRMAN EISENHOWER: We're not taking a  
22 deposition in court here.

23 MR. HELM: I understand that. But we're  
24 taking testimony and if we just have the witnesses state  
16:05:32 25 everything without a fair chance to test their statements,

1 then you're going to get --

2 CHAIRMAN EISENHOWER: You're getting that  
3 chance.

4 MR. HELM: And that's all I'm saying. I'm  
16:05:45 5 doing it just as fast as I can.

6 MR. MCGINNIS: I think Mr. Helm maybe just  
7 made the point I was going to stand up and say, and that  
8 is, he did have two and a half days or three days or  
9 whatever in the deposition. The transcript is in the  
16:05:50 10 record, it's already been admitted. I think he's covered  
11 a lot of the ground in the transcript again, from what my  
12 recollection of the reading the transcript. So he's got  
13 two and a half days, plus the four hours we've spent part  
14 of the time with Dr. Littlefield reading aloud from the  
16:06:02 15 patent files. So we're getting close to limit here. This  
16 is my opinion and it's our position.

17 MR. HESTAND: With the commission's  
18 permission --

19 MR. HELM: Do you think this was in the  
20 deposition, this report he filed the day before the  
21 hearing?

22 MR. MCGINNIS: Well, John, one of your  
23 witnesses hasn't filed a report at all yet. That's what  
24 the rules provide for.

25 MR. HELM: That's no problem.

1 MR. HESTAND: John Hestand on behalf of Gila  
2 River Indian community.

3 Due process, constitutional rights do not  
4 guarantee somebody the right to ramble for as long as they  
16:06:45 5 want. It is the standard in court that judges will tell  
6 people they have 45 minutes. Major cases that we're  
7 involved with, the adjudication of the general --  
8 adjudication of the water rights of the State of Arizona,  
9 they tell you have 45 minutes only to cross-exam this  
16:06:57 10 witness. There is no guarantee of 14 hours. Thank you.

11 MS. HERR-CARDILLO: Mr. Chairman, if I could  
12 just let you know, the witness that we have from out of  
13 town has a flight back to Maryland that is leaving at 7:00  
14 so he is not at liberty to stay past probably 5:30.

16:07:18 15 MR. HELM: It will be expedited quicker if I  
16 let him do it because I can then eliminate a bunch of  
17 these questions. I have just, in this little space, got  
18 rid of two more pages just by being able to see. But it's  
19 difficult to ask and read at the same time.

16:07:33 20 CHAIRMAN EISENHOWER: So if your two expert  
21 witnesses will eliminate a lot of questions, why don't we  
22 do that then?

23 MR. HELM: Well, I think that's a request  
24 for the Center for Law in the Public Interest. It will  
16:07:46 25 move me long because I can go read these and say, "I've

1 already covered this," and go on to the next page.

2 MR. MCGINNIS: Dr. Littlefield also has a  
3 flight out this evening. He's been on the stand since 11  
4 o'clock this morning. So I understand his problem.

16:08:02 5 If you want to give Mr. Helm some time while  
6 the other person testifies and come back, a specific  
7 eliminate of time, I don't have a problem with that. But  
8 if we come back and go on all night, we're going object to  
9 that.

16:08:15 10 MR. HELM: I'm not going to go on all night.

11 MR. MCGINNIS: You've already gone on all  
12 day.

13 COMMISSIONER ECHEVERRIA: Let's let the guy  
14 from Center for Law in the Public Interest speak.

16:08:32 15 MR. HELM: I think it will end up  
16 expediting things.

17 CHAIRMAN EISENHOWER: All right.

18 EXECUTIVE DIRECTOR MEHNERT: Is this the  
19 same case or is this the Verde case they're talking about?

16:08:38 20 CHAIRMAN EISENHOWER: He has a flight out  
21 tonight, correct?

22 MR. MCGINNIS: Yes.

23 CHAIRMAN EISENHOWER: We're getting into  
24 flights here, and I'm sorry. How long are you going to  
25 take?

16:08:49

1 MR. HELM: I am not responsible for  
2 questions I'm asked, but I, myself, will take 20 minutes  
3 at the most.

4 MR. MCGINNIS: But he's going to talk about  
16:09:01 5 the Verde, correct?

6 CHAIRMAN EISENHOWER: You're going to talk  
7 about the Verde, correct?

8 MR. HELM: Yes.

9 CHAIRMAN EISENHOWER: We may not get to the  
16:09:07 10 Verde, that's what I warned the other participants about  
11 earlier today is that we wanted to finish the Gila today.  
12 And if we have to reconvene the Verde in January, that's  
13 what we will do. So I hope you understand that. But I --  
14 what I want to do is get the Gila out of the way. And  
16:09:29 15 believe me, this is nothing against you. I would love to  
16 see you and hear your presentation, but we've got -- we're  
17 in the midst of a river right now.

18 MR. HELM: I used to do arbitration. I  
19 understand. It's all right.

16:09:50 20 CHAIRMAN EISENHOWER: Okay. If we can  
21 expedite the two witnesses that Mr. Helm has, then fine,  
22 let's go ahead and do that.

23 (An off-the-record discussion ensued.)

24 MR. HELM: John Helm for Maricopa County  
10:19 25 again. Our first is Dr. D.C. Jackson. Dr. Jackson is a

1 professor of history at Lafayette College. He has a Ph.D.  
2 from the University of Pennsylvania, a master's degree  
3 from the University of Pennsylvania, and an engineering  
4 degree from Swarthmore College. He's been a fellow with  
16:10:48 5 the Hayden museum and library at the Dibner Institute for  
6 the History of Science and Technology at the Massachusetts  
7 Institute of Technology, the Philadelphia Center for Early  
8 American Study at the University of Pennsylvania, and  
9 predoctoral fellow at the National Museum of American  
16:11:01 10 History for the Smithsonian Institution. So he's an  
11 unusual -- a bear in one sense that he's got an  
12 engineering background --

13 COMMISSION COUNSEL JENNINGS: Mr. Chairman,  
14 let him testify as to his credentials. There's no reason  
16:11:18 15 to have this advocacy on -- if we have any interest in  
16 what his credentials are, we can ask him those questions.

17 MR. HELM: Could I note for the record that  
18 -- Curtis, you have acted all day as an advocate instead  
19 of as a representative of the commission, and to a certain  
16:11:32 20 degree, some of us wonder how impartial you really are.  
21 I'll let him do his own credentials.

22 COMMISSION COUNSEL JENNINGS: You have been  
23 very rude, not only to me but to the commission and to all  
24 of the other witnesses here, Mr. Helm, today.

11:56 25 DR. JACKSON: Thank you for the opportunity



1 to come and speak to you today.

2 CHAIRMAN EISENHOWER: No problem.

3 DR. JACKSON: We're just waiting to get this  
4 set up. Could somebody just sit there and actually click  
16:12:05 5 that, because I would like to -- I actually would like to  
6 speak from over here so I can also see.

7 (An off-the-record discussion ensued.)

8 DR. JACKSON: While they're setting that up,  
9 my background is I got a bachelor of science degree in  
16:12:28 10 engineering from Swarthmore College in 1975. Actually  
11 worked for the National Park Service for many years, then  
12 I went back to graduate school, in history -- or the  
13 degree is officially in American civilization.

14 I've been teaching at Lafayette College  
16:12:47 15 since 1989. My specialty is the history of dams, the  
16 history of water in the west, and the way that I came to  
17 Arizona was actually through an interest in the dam  
18 engineer who designed the Cave Creek Dam, and he was the  
19 subject of my book, John S Eastwood -- or "Building the  
16:13:02 20 Ultimately Dam: John S. Eastwood and the Control of Water  
21 in the [American] West."

22 Recently I've done work on the St. Francis  
23 Dam disaster with Norris Hundley, a very well-known  
24 historian and Professor Emeritus at UCLA. And I have a  
13:18 25 book coming out next year with Dave Billington, a

1 historical data relative to navigability on the lower  
2 Gila. For most of that -- or much of the work there was  
3 done in the report from the Arizona State Land  
4 Department -- I think this is one that Mr. Gilpin and  
16:14:53 5 Mr. Fuller were involved with, that's a major source of  
6 that -- review that historical data, add to it, consider,  
7 and then assess how that historical data relates to the  
8 appropriate standard of navigability and then make a  
9 determination. Next.

16:15:07 10                   Okay. What is the standard to be used?  
11 Must battleships and aircraft carriers be able to navigate  
12 year round? No.

13                   Must large-scale commercial barges apply the  
14 waters year round? No.

16:15:19 15                   Must it meet the standards of navigability  
16 applied to the -- by the U.S. Supreme Court in the Daniel  
17 Ball decision? Yes.

18                   Okay. Just a quick review. We've heard a  
19 fair amount about this over the last two days. I think  
16:15:29 20 this is the first time that I have actually gone up on the  
21 slide what this might be. I realize the commission is  
22 probably well aware of this definition, but I would like  
23 to just reinforce it.

24                   This comes from that 1870 ruling. Those  
15:49 25 rivers must be regarded as public navigable rivers in law

1 which are navigable in fact. And they are navigable in  
2 fact -- next -- when they are used or are susceptible of  
3 being used in their ordinary condition as highways for  
4 commerce over which trade and travel are or may be  
16:16:02 5 conducted in the customary modes of trade and travel on  
6 water. And I would say with this highlight, that  
7 highlight is not in the original definition, I just  
8 highlighted it here so that you could see it. I put that  
9 in there.

16:16:12 10 The key here, though, is that when they are  
11 used or are susceptible of being used in their ordinary  
12 condition as highways for commerce -- not highways of  
13 commerce, which oftentimes I see that phrase used --  
14 highways for commerce over which trade and travel are  
16:16:29 15 used. Next slide.

16 Okay. The Daniel Ball decision was not  
17 originally issued in the context of the equal footing  
18 doctrine. It came up in another context. I usually think  
19 of it as the commerce clause context. However, it became  
16:16:49 20 the standard and it was used in this very important case,  
21 U.S. versus Holt Bank, which is an equal footing doctrine  
22 case, relates to Mud Lake, which is in Minnesota, and the  
23 issue of whether that was to be a state land under -- you  
24 know, controlled by Minnesota under this doctrine. And in  
17:04 25 this ruling, which is by the U.S. Supreme Court in 1926,

1 it states that navigability does not depend on the  
2 particular mode in which such use is or may be had nor on  
3 an absence of occasional difficulties in navigation.  
4 Navigation does not need to be continuous either through a  
16:17:23 5 stretch of river or over time. The Daniel Ball definition  
6 is also expanded in this case to refer to natural and  
7 ordinary condition. And I think you will see that this is  
8 the case in which that phrase -- which I've heard a lot  
9 about today -- comes into being in the specific context of  
16:17:40 10 the equal footing doctrine. It also -- this case also  
11 refers to a channel for useful commerce. Now the question  
12 is what is useful commerce?

13                   Okay. Final court case that I'm going to  
14 use -- which I used all of these in making my  
16:17:54 15 determination because this is how -- what is the standard?  
16 How am I to define? That's what I'm opining about. So I  
17 go to another U.S. Supreme Court case on the equal footing  
18 doctrine. To my knowledge, this is the most recent case  
19 that the Supreme Court has actually ruled on. This is  
16:18:09 20 1971 and this clarifies the definition of useful commerce.  
21 This case relates to navigation of the Great Salt Lake.  
22 Is the Great Salt Lake -- near Salt Lake City -- is it  
23 navigable or not? And in this case, what was ruled was  
24 commerce does not need to be commercial in terms of  
18:30 25 formalized public transportation between far-flung cities,

1 ports, or harbors.

2 In fact, what this case relates to or what  
3 it hinges on is there are islands in the Great Salt Lake.  
4 They are not large islands, they are not prominent, but  
16:18:51 5 the Supreme Court -- and they are special masters --  
6 discerned and ruled that there was ferrying of sheeps to  
7 islands in the Great Salt Lake that took place as part of  
8 local farming and agricultural operations, and they  
9 determined that this was sufficient to demonstrate  
16:19:02 10 navigability. And it was also seen that the furtherance  
11 of local farming operations on the shores of the Great  
12 Salt Lake was sufficient to meet the standard of useful  
13 commerce. And I wanted to -- here is specific language  
14 from the case.

16:19:23 15 Okay. Here specifically that the U.S.  
16 Supreme Court stated that "The hauling was apparently done  
17 by owners of the livestock, not by a carrier for the  
18 purpose of making money." Hence, it is suggesting that  
19 this was not the use of the lake as a navigable highway in  
16:19:32 20 the customary sense of the word. That is to say the  
21 business of the boats was ranching and not carrying  
22 water-born freight. "We" -- this being the court --  
23 "think that is an irrelevant detail."

24 The lake was used as a highway and that is  
19:53 25 the gist of the federal test. And this is not commercial.

1 And furthermore, it is suggested that the carriage was  
2 also limited in the sense of serving only the few people  
3 who performed ranching operations along the shores of the  
4 lake. But that, again, does not detract from the basic  
16:20:06 5 finding that the lake served as a highway, and it is that  
6 feature that distinguishes between navigability and  
7 non-navigability.

8 This is the standard that I'm looking to in  
9 now looking -- evaluating the lower Gila. And I would say

16:20:21 10 also, here, for the case here, that's specific to this  
11 commission and Arizona, the Defenders of Wildlife versus  
12 Hull, we have the Court of Appeals of Arizona case that  
13 affirms that the Daniel Ball standard of navigability is  
14 necessary for adjudicating the equal footing doctrine.

16:20:36 15 And this case also affirms that navigable in fact is  
16 navigable in law.

17 Now, I'm just going to run through this  
18 issue of the natural and ordinary condition of the lower  
19 Gila. In this period, 1846, is when Anglo-Americans first  
16:20:52 20 had a presence in the region through 1912, statehood.

21 Originally my colleague Win Hjalmarson who was going to be  
22 speaking in a very significant way about these conditions  
23 as flow, looking at it from a hydrologist's point of view.

24 So I'm not going to go into a lot -- he was originally  
21:13 25 going to go first. So I'm not going to get into details

1 here, but I want to just give a snapshot over this and  
2 maybe it will be a prelude to what he's going to talk  
3 about.

16:21:24

4                   During the latter 19th century, enormous  
5 quantities of water were diverted from the Salt and Gila  
6 Rivers, perhaps for irrigation. I think we all know --  
7 this is something that I have been aware of, actually, in  
8 research that I have done on Roosevelt Dam, on other dams  
9 in the region, my knowledge of what was the Salt River  
10 Valley Water Users Association, which then becomes SRP.

16:21:38

11                   In the early 20th century, construction of  
12 the Roosevelt Dam commenced on the upper Salt River. And  
13 for my purposes, the Salt River is just as important as  
14 the upper Gila in terms of the lower Gila. Once the  
15 confluence is met -- I realize in the context of your  
16 determination, you deal with Gila and you deal with  
17 Salt -- but when it comes to the lower Gila, the Salt  
18 River is just absolutely essential, and also the Verde.  
19 They are a tributary to what I am addressing here. And

16:21:54

16:22:09

20 the construction of Roosevelt Dam starts in that period,  
21 1905, 1906. It's officially not completed until March of  
22 1911 when Teddy Roosevelt comes. However, water storage  
23 starts by 1909. And in fact, this becomes evident because  
24 the town of Roosevelt, which was in the reservoir take  
25 area -- during construction, they had to move it because

22:28

1 waters were coming up. So storage begins to take place by  
2 1909 on a very significant tributary.

3 And here we have Win in his report -- the  
4 natural and ordinary flow of the river was tremendous, but  
16:22:51 5 the actual flow was significantly diminished by  
6 irrigation, diversion, and storage. And my opinion is  
7 that any application of the Daniel Ball standard must  
8 address the natural and ordinary flow.

9 Okay. Let's look at some of these ways in  
16:23:04 10 which some evidence -- okay. You have the Kearney  
11 expedition in 1946. It describes the lower Gila River as  
12 about a hundred yards wide and flowing along a sandy  
13 bottom. And that is taken from the -- that material from  
14 the Arizona State Land Department report.

16:23:25 15 We also have the diversions of the Salt and  
16 Gila commenced by the 1860s -- certainly swirling ditch  
17 was underway by the late 1860s, enormous amount of water  
18 taken out in the 1880s. The predecessor dam for the  
19 Granite Reef was called the Arizona Dam, was completed in  
16:23:39 20 the mid-1880s. And they only built Granite Reef because  
21 it washes out in the floods of 1905. And as with these  
22 diversions, however, as reported in a 1923 USGS water  
23 supply paper -- this is one that Dr. Schumm referred to  
24 this morning -- or it's in -- I don't think he referred to  
23:56 25 it, but it's in his report -- a rancher in 1889 described



1 the river between Buckeye and the Gillespie Dam site as  
2 having a well-defined channel with hard, sloping banks  
3 lined with cottonwood and bushes.

4                   Okay. I will leave to you -- to Win to  
16:24:15 5 really fill in many, many of the -- much of the detail on  
6 what the ordinary and natural condition would be. But  
7 that's just to set it up. It was very different than what  
8 it is today.

9                   Okay. What I'm going to do is run through  
16:24:29 10 evidence that provides of historical navigation of the  
11 lower Gila River in this period. One of the first ones, a  
12 very famous one, is the Cooke or the Mormon Battalion  
13 journey that takes place very early January 1847 from the  
14 Gila Bend vicinity to Yuma. Members of the battalion  
16:24:52 15 fashioned a boat out of two wagons. We don't know exactly  
16 the dimensions of these wagons, but these were not wagons  
17 that were designed for river travel. This journey  
18 suffered difficulties with low water -- I think that has  
19 been well recorded -- but it reached Yuma in several days  
16:25:05 20 and successfully navigated the lower Gila River. Cooke  
21 himself, who was interested in getting to California to  
22 fight in the Mexican War, did not consider it successful.  
23 But for our purposes, it was successfully navigated. Even  
24 though cargo had to be taken out, they got there.

:25:23 25                   Okay. In that same period, around 1849 --

1 this is journey that is documented in several books, it  
2 has sort of varying details -- but this is the one that's  
3 the Mrs. Howard slash Pancoast journey. This is the one  
4 where supposedly the first Anglo-American child was born  
16:25:43 5 in transit. Sometimes it's referred to as a boy,  
6 sometimes a girl. I guess it's named "Gila" so I don't  
7 know if you can really tell by the name.

8                   What's important here, though, is that  
9 Pancoast, who writes a book describing this even though he  
16:26:01 10 did not actually go on the journey, he was aware of it and  
11 it's recorded in there. This is the kind of evidence  
12 that, in and of itself is not, I would say, absolutely  
13 determinative. There are some books that were written  
14 later. But it speaks to the kind of issue that this is  
16:26:16 15 where we get evidence that people are certainly thinking  
16 about navigation on the lower Gila. We have the Cooke  
17 battalion where it's being done in the context of getting  
18 to California in 1849. It fits into that structure.  
19 Let's go to the next.

16:26:33 20                   This is the first newspaper article I'm  
21 going to make reference to. This is one that published in  
22 the New York Tribune in February of 1850. It's a letter  
23 anonymously sent from a place called "Camp Salvation" to  
24 the New York Tribune, which by its date, February 1850, I  
26:51 25 think it can be fair to assume that it refers to the year

1 before when the '49ers are going down the river. And it  
2 indicates use of the Gila River by westward travelers.  
3 And it was reported that travelers reaching the Colorado  
4 River had made use of boats on the Gila River to lighten  
16:27:06 5 loads pulled by wagon teams.

6 Now there is discussion -- I know that your  
7 commission has heard -- or evidence on how to use  
8 newspaper articles. I think we should always be careful  
9 as historians to sort of evaluate and assess them. I find  
16:27:21 10 this to be persuasive in the sense of providing evidence  
11 that in the context of the fact that we know the Mormon  
12 battalion had made use of the river -- and there is other  
13 discussion of the Howard/Pancoast journey going down the  
14 river -- that this seems plausible. This is going to be  
16:27:39 15 part of the mosaic. This is going to be one of these that  
16 we use to assemble a sense of, "Did navigation take  
17 place?" Go to next one.

18 Okay. The next newspaper article to make  
19 reference to here is one that appears in February of 1881.  
16:27:56 20 This is a river trip by Cotton and Bingham that goes from  
21 Phoenix to -- or announces that they're going from Phoenix  
22 to Yuma, scheduled to leave the next day, and it indicates  
23 that the journey is to be made in an 18-foot long skiff.  
24 There are no subsequent reports on this impending trip, on  
28:14 25 whether it occurred or not. But it certainly brings to

1 mind that travel was considered and that there was a boat.  
2 It gives you information that this was something in the  
3 realm of possibility and the newspaper reported that.

4           Next one we have, this is the famous Buckey  
16:28:32 5 O'Neill. I guess this is the "Yuma or Bust" journey. And  
6 this is reported in at least -- or two issues of the  
7 Phoenix Gazette. And he makes a journey down the Gila  
8 from Phoenix -- or from the Salt and then to the Gila in  
9 November/December 1881. The reports indicate at the time  
16:28:52 10 that the boat had to be pushed by men wading in water --  
11 and I quote here -- "up to their knees," and the newspaper  
12 indicated that the voyage, while scheduled to reach Yuma,  
13 may have concluded in Gila Bend. There is some debate in  
14 some of the accounts of whether they actually made it to  
16:29:06 15 Yuma, but it seems quite certain they made it to Gila  
16 Bend. And even though they might have had to push the  
17 boat, water up to their knees indicates there's water up  
18 to their knees and that's not an insignificant amount of  
19 water.

16:29:23 20           I got ahead of myself. The O'Neill voyage  
21 with crew members wading up to their knees may have  
22 encountered difficulties in the journey to Gila Bend. But  
23 as stipulated by the U.S. Supreme Court in U.S. versus  
24 Holt Bank, navigability does not depend on the particular  
29:36 25 mode in which such use is made or may be had nor on an

1 absence of occasional difficulties in navigation.

2           Okay. Next one that takes place. This is,  
3 I think, a linchpin in story, one that gives me confidence  
4 in terms of newspapers. It's report in two different  
16:29:56 5 newspapers about a journey that Amos Adams and J.W. Evans  
6 -- in one of the reports it's published G.W. -- they  
7 journeyed down the full length of the Gila River to Yuma  
8 in boat that's 3 and a half by 18 feet of the flat bottom  
9 type. And it is described, actually, in three separate

16:30:14 10 newspaper articles. And actually this is the one I  
11 really -- when I wrote the one that I developed with the  
12 slide here, I realized I would like to read to you  
13 specifically -- this is a letter that they sent --  
14 actually, in the journey, they come down, they stop off in

16:30:34 15 Phoenix after making it to what to them was by far the  
16 most arduous part of the journey, coming through the Box  
17 Canyon from the Rialto reaches near -- I think it's  
18 Evans -- maybe it Adams, Evans or Adams -- from Morenci.  
19 He's taking a vacation. They get to Phoenix and that's

16:30:59 20 when they talk to the newspapers and then after they leave  
21 and they get down to Gila Bend, they send a letter back,  
22 and in fact, here I have almost the quote. The reach from  
23 Phoenix to Gila Bend is described by Adams: "We found  
24 nothing usual on our journey down the Salt and Gila Rivers  
31:07 25 except that ducks were plentiful." And in fact, I want to

1 read, actually, the whole transcript, it's just one  
2 paragraph, here it is. It's called "Venturesome Voyagers"  
3 is the title here. Wait, no, that's not the report that  
4 they were going to head off.

16:31:24

5 Okay. Here is the letter and it's dated  
6 February 23rd, from Gila Bend. "Editor Herald in terms of  
7 my promise to write, I wish to say that we found nothing  
8 usual on our journey down the Salt and Gila Rivers except  
9 that ducks were plentiful and that Evans ate so much of  
10 them that he quacks now instead of talks." Little human  
11 interest. "That, of course, is strange. In fact,  
12 phenomenal, as we will all testify who know him.

16:31:43

13 "On entering or passing through the range of  
14 mountains that the river cuts, called the Estrella or Gila  
15 Bend, we got into a mineral zone, judging from the looks  
16 of the country rocks, which is a granite formation, and  
17 believe that in them there is a good field for a  
18 prospector. We have arrived at the Wolfley Dam and" --

16:32:00

19 Now, the Wolfley Dam is the original dam that was built  
20 that was to provide water for Gila Bend. This is the one  
21 that washes out. In fact, we're going to come back to it  
22 in a second here, but it washes out very soon after it's  
23 built, it's completed in 1893, and it's always in  
24 disrepair. And they are starting to set out to build what  
25 is sometimes called the second Wolfley Dam, usually it's

16:32:16

32:32

1 oftentimes called the Peoria Dam, because the investors  
2 were from Peoria, and there's actually a second dam that's  
3 there, that -- it also washes out and then eventually  
4 though that site is what is developed by the Gillespie Dam  
16:32:58 5 starting in 1919.

6           Okay. So he says, "We have arrived at the  
7 Wolfley Dam and find about 600 feet washed away and no  
8 sign of anyone repairing it. But below, we saw that a  
9 number of men and teams were at work on another dam, the  
16:33:08 10 work being pushed by Toomey and George. We found plenty  
11 of bees and a cave of honey. Oh, we are sweet. Flipjacks  
12 and honey. We are at the Southern Pacific pumping station  
13 four miles from Gila Bend. We're passing through a fine  
14 country which has adapted to agricultural purposes and are  
16:33:30 15 surprised at the evidence of thrift and enterprise to be  
16 seen as we sail along of the ranchers that have settled  
17 along the river. Yours, Amos Adams."

18           So they see ranchers, it's there, it's  
19 evident. I think this is pretty clear. They made this  
16:33:46 20 journey. I'm looking at this -- I read this, they made  
21 this journey. They also, then, later when they make it to  
22 Yuma, he gets back, he writes -- in this case it's -- I  
23 think it's still Amos. Let me make sure. In another  
24 letter it's either Adams or Evans. This is the one where  
34:15 25 the reference is made, "Oh, I would never make that

1 journey again," but this is because of going through the  
2 Box Canyon on the upper portion of the river. This has  
3 nothing to do with the lower Gila River. There is nothing  
4 in there to indicate that they didn't have a fine journey  
16:34:31 5 from the confluence of the Salt and the Gila down to Yuma,  
6 and they make reports on it. And I think this journey  
7 took place. This journey indicates that the river is  
8 susceptible for navigation, in fact, along its full length  
9 in 1895. Okay, go to the next slide.

16:34:57 10 Okay. That's -- I have should have gone  
11 through that.

12 Okay. Here's one final newspaper article.  
13 Navigability of the lower Gila River is further  
14 substantiated by a report of Jack Shibley, says he set out  
16:35:05 15 on a voyage from Phoenix to Gila Bend. It's reported on  
16 April 3rd, 1905, and his boat apparently capsized once,  
17 but it made it to Gila Bend. That would be in the year of  
18 the great floods.

19 Now what I want to do here is switch to a  
16:35:26 20 different kind of evidence. We've looked at newspaper  
21 articles. And I think, in reading some of the testimony  
22 of some previous hearings, Dennis Gilpin has made a point  
23 that sometimes the most effective and convincing evidence  
24 is that which doesn't come from newspaper articles but  
35:38 25 comes from a source that's not really specifically talking



1 about, let's say, navigation, but you learn about it. You  
2 learn about it in some way. That's not the focus, but you  
3 learn about it a very direct way of how it takes place.

4           What I would like to look at now, and this  
16:35:58 5 is a case -- or it comes from a transcript from testimony  
6 of a case before the General Land Office -- or at the  
7 United States Land Office in Phoenix in March of 1911.

8 And this is the case here, the Enterprise Land and Water  
9 and Gila River Water Company versus Frank Heresford and

16:36:30 10 James Bent Irrigation Company. And anyone who sort of

11 studies the history of the Gillespie Dam realizes after

12 those two dams fail, I'm sure the lawyers in this room

13 will be shocked to learn, an enormous of litigation

14 ensued. And this is one of the many cases that this --

16:36:40 15 that sort of come out of that. It's relatively light. Go

16 to the next slide.

17           Okay. In this, Streit testified -- now, I

18 must have been -- when I wrote this -- testified under

19 oath. I assumed it was under oath, but then I got here

16:37:00 20 today and I realized that hearings sometimes take place

21 not under oath. It certainly has taken place at a formal

22 hearing. There is a court reporter present. There is

23 taken directly from -- this information is taken directly

24 from the court reporter's transcript of what transpired.

37:08 25 So when I say under oath, I probably should have scratched

1 that out. So with that caveat.

2 And he states that he is county surveyor.

3 And I also realized, when I was looking at this yesterday,

4 he definitely testifies that he is the county surveyor.

16:37:27 5 He actually testifies this in 1911. I can't be absolutely

6 certain he was the county surveyor in 1893. However, his

7 testimony relates to his work as a surveyor in 1893. And

8 it was surveyed in locations -- and I use that quote that

9 he talks about -- "were made near the Wolfley Dam site,"

16:37:42 10 which is the future site of Gillespie Dam. And in this

11 we're going to see -- and I'm going to give you a verbatim

12 of how I transcribed it here -- detail, "Streitz describes

13 using 'Dougherty's skiff' to cross the river as part of

14 his work." Dougherty is indicated in other parts of this

16:37:59 15 transcript as a local rancher and farmer near where

16 Streitz and his men camped. Go to next slide.

17 Okay. So this is taken directly from that

18 testimony that he provides, and here we have the question:

19 "Were you there before the Gila Dam

16:38:13 20 was built.

21 "Answer, George Streitz: Oh, yes, we

22 made two surveys."

23 That should be question. "Two

24 surveys, whereabouts was the channel

38:29 25 of the Gila River, that is the water

1 channel, when you first saw it?"

2 And I think this also is significant. What  
3 this is about is the effect of the construction of Wolfley  
4 dam on the location of the channel that was used, which is  
16:38:37 5 what these parties were interested -- they're not  
6 interested in, per se, navigating, but they are interested  
7 in where the channel is. Go to the next one.

8 Streitz goes, "On the extreme east  
9 bank, almost opposite the Hualpai Butte.

16:38:48 10 "Question: How close was it to what  
11 is now known as the headgates of the"  
12 damsite of the Gila Water Company.

13 Word problem there, but I transposed them  
14 some. But the headgates of the Gila Water Company dam.

16:39:06 15 "Answer:" By Streitz, "as near as I  
16 can recollect, the location was below  
17 where we landed, back and forth, with  
18 our outfits to get across. I will explain  
19 a little if you will permit me." Continue.

16:39:20 20 "Go ahead.

21 "Streitz: We passed back and forth to  
22 get from our camp, which was on the west  
23 side of the river near Dougherty's, and  
24 walked down to the river and made turns  
39:29 25 in getting across the river in Dougherty's,

1 and one man had to make the return, and  
2 that's how I got these locations noted."

3 Next slide.

4 Okay. What's important here is -- okay,  
16:39:38 5 this is not about navigation. This is about water rights,  
6 water issues, where -- how this is going to be. But we  
7 learned Streitz uses the Gila River as a highway for  
8 commerce in a simple and direct way. They use this and --  
9 just as importantly, the testimony indicates that

16:39:59 10 Dougherty had a skiff as part of his farm, ranch  
11 equipment. And this would be those same kind of people  
12 that Amos and Evans saw when they took their journey down  
13 the Gila River and they saw those farmers and those  
14 ranchers get along. Okay. That's really important. This  
16:40:09 15 is evidence; here we have that a rancher along the Gila  
16 River has a skiff. And then a surveyor makes use of it.

17 Okay. Recall the Supreme Court ruling in  
18 Utah versus U.S., quote: It is suggested that the  
19 carriage was also limited on the Great Salt Lake in the  
16:40:29 20 sense of serving only the few people who performed  
21 ranching operations along the shores of the Great Salt  
22 Lake. But that does not detract from the basic finding  
23 that the lake served as a highway, and it is that feature  
24 which distinguishes between navigability and  
40:39 25 non-navigability. So what we have -- doesn't have to be

1 extensive use. Doesn't have to be -- but you use the  
2 river as a highway for commerce.

3           Okay. Boating along the Gila River by  
4 Dougherty was apparently a part of his activity as a farm  
16:41:01 5 or ranch. This is directly analogous to the use of the  
6 Great Salt Lake by local Utah farmers to ferry to the  
7 island as a part of the business of being a sheep rancher.  
8 Next.

9           Okay. Here's the conclusion. Evidence is  
16:41:07 10 clear that the lower Gila River was susceptible for use as  
11 a highway for commerce in period 1846 to 1912. We have  
12 enough of that -- certainly the Amos evidence indicates  
13 that. Natural and ordinary conditions of flow were  
14 dramatically altered by river diversion and storage prior  
16:41:28 15 to 1912. Nevertheless, navigation of the river and  
16 portions thereof was undertaken by a range of travellers  
17 in that period. Next.

18           The natural and ordinary conditions and use  
19 along the lower Gila River provides clear evidence of the  
16:41:37 20 Daniel Ball standard of navigability was met. And thus,  
21 in my opinion, the lower Gila River is navigable in the  
22 context of the equal footing doctrine and should be  
23 recognized as such. And that concludes my testimony.

24           CHAIRMAN EISENHOWER: Any questions?

42:12 25           Is there anybody in the audience that has

1 any questions for Dr. Jackson?

2 (Dr. Jackson is answering questions.)

3 BY MR. MCGINNIS:

4 Q. Mark McGinnis on behalf of Salt River Project.

16:42:29 5 Dr. Jackson, couple quick questions. It's true, isn't it,  
6 that you have not submitted a report to the commission on  
7 this issue, have you?

8 A. I have provided the material to the lawyers. I  
9 don't know whether it has been provided to the commission  
16:42:37 10 or not. I provided this PowerPoint in last few days.

11 Q. Other than the PowerPoint presentation --

12 A. That is correct.

13 Q. -- you have not done anything else that's  
14 submitted to the commission?

16:42:45 15 A. I did have a deposition in the Gillespie Dam case  
16 which, I presume, might have been, I have no knowledge of  
17 that. But, no -- other than that, no.

18 Q. And you're not a lawyer.

19 A. That is correct.

16:43:01 20 Q. Not admitted to the bar in Arizona?

21 A. No, sir.

22 MR. MCGINNIS: That's all the questions I  
23 have.

24 (Dr. Jackson is answering questions.)

25

1 BY MR. SPARKS:

2 Q. Dr. Gillespie, I'm Joe Sparks on behalf of the  
3 San Carlos Apache tribe, the Tonto Apache tribe -- the  
4 Tonto Apache tribe, Yavapai Apache Nation -- Tucson.

16:43:16

5 By the way, that's Walpai not Halpai.

6 A. I apologize.

7 Q. And Gila is a Spanish word, and when it ends in  
8 A, it's female.

16:43:29

9 In any event, do you have any information in  
10 your testimony that would refer to a time period other  
11 than the period from 1893 to 1895?

12 A. 1893 to 1895?

13 Q. Yes.

16:43:45

14 A. I have had there, I think, that we talk going  
15 back to 1846.

16 Q. Was there anything up there that referred to  
17 document other than -- or a report other than 1893 through  
18 1895?

19 A. I believe there was.

16:44:00

20 Q. Which one was it?

21 A. Maybe I don't understand the question. Say that  
22 again.

23 Q. Which document do you refer to in your PowerPoint  
24 that is referring to the period other than 19- --

44:06

25 A. So you want to know about those ones talking

1 about --

2 Q. Let me just finish the question.

3 A. Certainly.

4 Q. -- 1893 through 1895?

16:44:18 5 A. Do I have anything other than that?

6 Q. Yes. On your PowerPoint, did you do anything  
7 other than that?

8 A. No. I apologize, it has been 2 days. I'm just  
9 not sure I understand what the question was. Just repeat  
16:44:33 10 it one more time and I will be as clear as I possibly can  
11 be.

12 Q. Do you refer in your testimony before the  
13 commission specifically to any reports other than those  
14 between 1893 and 1895?

16:44:51 15 A. I make reference in my -- the report to material  
16 that is documented in the Gila River Navigability Study  
17 for the Arizona State Land Department that makes  
18 references to reports from the period 1846/47 through  
19 1905.

16:45:05 20 Q. But other than referring to the report -- which  
21 you didn't write?

22 A. That's correct.

23 Q. -- you don't refer to any reports for the  
24 commission to look at?

45:12 25 A. Not that I'm aware of. I'm trying to understand



1 your question.

2 Q. The other question I want to ask you is what  
3 period during the year did these reports refer to?

4 A. Which reports?

16:45:30 5 Q. Any of the reports that you referred to.

6 A. In the one -- I'm not exactly sure in terms of  
7 the Streitz testimony what part of that -- it's 1893, but  
8 I don't know the specific time of the year.

9 Q. Well, were there any other periods except  
16:45:37 10 November through April of a calendar year?

11 A. Not that I'm aware.

12 Q. Okay. Are you aware of the flows of Gila River  
13 at that time?

14 A. Specifically -- I'm aware in a general sense  
16:45:51 15 because I've read Win's report and I have read that -- I  
16 do not have specific information now on that at this  
17 point, but Win could provide evidence or --

18 Q. So the answer is no?

19 A. That would be correct.

16:46:02 20 Q. Okay. We could get through this faster if you  
21 just say yes or no if it calls for that answer, okay?

22 A. I will try.

23 Q. Okay. That wasn't a yes?

24 A. No, it wasn't.

46:16 25 Q. Okay. Now, are you familiar with any reports

1 that refer to navigating the Gila River from May through  
2 October of any year during which you testified?

3 A. Not specifically, no.

4 Q. Okay, thank you.

16:46:33 5 By the way, when Buckey was pushing the  
6 boat, do you consider walking part of navigation?

7 A. Well, you know, most --

8 Q. Yes or no?

9 A. Yes. If they are pushing a boat. And boats,

16:46:49 10 oftentimes, need to be propelled and walking is one way  
11 the propel a boat.

12 Q. You could propel a scooter the same way, right?

13 A. Presumably.

14 MR. SPARKS: Thank you.

16:47:00 15 CHAIRMAN EISENHOWER: Are there any other  
16 questions for Dr. Jackson?

17 Hearing none, thank you, Dr. Jackson.

18 DR. JACKSON: Thank you.

19 MR. HELM: Our next witness is Hjalmar

16:47:29 20 Hjalmarson. He goes by the name of "Win" for the rest of  
21 us and will answer to that to the commission. He's a  
22 consulting hydrologist. He's a P.E. and a long-time  
23 employee of the United States Geological Service. I'll  
24 let him fill you in a little more on his qualifications.

47:48 25 CHAIRMAN EISENHOWER: Thank you.

1 (An off-the-record discussion ensued.)

2 MR. HJALMARSON: Okay. I'm Win Hjalmarson.

3 A true Arizona native. And a long list of -- Kenilworth  
4 grammar school. As far as I can tell, I'm the only person

16:50:20 5 that I've listened to here that has actually measured the

6 Gila River. I measured it at Gillespie Dam, Painted Rock

7 dam, down at Dome. I think that I'm the only person that

8 has been stuck in Gila River back in the 1960s, and the

9 sand is very soft in places. And so I have been there and

16:50:40 10 done that in a way.

11 I'm a -- I have worked in Arizona with the

12 USGS from 1964 to 1993. And I was the service water

13 specialist for 12 years -- the last 12 years. So I do

14 have some experience with it. I'm also a registered

16:51:04 15 engineer in the state. So I'll be talking about the

16 navigability along the natural channel from the confluence

17 with the Salt to the mouth.

18 This supplements a report that I wrote in

19 2002. And on these slides in the lower right-hand corner

16:51:31 20 in blue, you will see a page number and that references

21 the talk to the report.

22 And I was hired to answer the question:

23 "Was the lower Gila River susceptible to navigation in its

24 natural and ordinary condition at statehood using the

51:48 25 federal standard?" And this is the standard. I think we

1 have gone over that plenty. The outline for this talk  
2 is -- well, I'll present a couple of important terms, and  
3 then I'm going to give some background hydrology to show  
4 some photographs of water and how beautiful this state is,  
16:52:17 5 and then I'll get into the report itself, which is the  
6 hydrology, the hydraulics and morphology, and the  
7 navigability. Important hydrology terms -- this is  
8 standard stuff -- just, cubic foot is about seven and a  
9 half gallons. What I really want to present here is,

16:52:42 10 "What is CFS?"

11 Okay. Here we have cubic foot moving down a  
12 river, and in one second, it passes the arrow. So we have  
13 1 cubic foot per second is a CFS. And this is what  
14 50 cubic feet per second or CFS looks like. This is up in  
16:53:06 15 Camp Verde. I took this photo a couple of years ago.  
16 This is what 250 CFS looks like. This is at the Salt  
17 River crossing above Roosevelt Dam. And a CFS is about  
18 448.73 gallons per minute or GPM, and there's the acre  
19 foot equivalent.

16:53:34 20 "Q is the rate of flow of water or the  
21 discharge of a canal, stream, or river," so it -- Q is  
22 discharge. Okay. And runoff is that part of  
23 precipitation which naturally appears in surface streams,  
24 and emphasis on naturally. It's the same as streamflow,  
:54:00 25 except it's unaffected by and anthropogenic case effects

1 or the works of man and so forth.

2 Here is an example, a little cartoon, that  
3 shows direct runoff and base flow. And the direct runoff  
4 is shown by the blue arrows on the surface here, so you  
16:54:32 5 have precip or snow melt that comes off, goes down the  
6 river, once it's in the river it's direct runoff, then you  
7 have the water that infiltrates into the ground, slowly  
8 makes its way to the river or stream, and that's the base  
9 flow. That's very important in terms of navigability in  
16:54:49 10 the lower Gila because during the dry periods, which  
11 are -- can be rather long, you need water in the river to  
12 navigate on.

13 Okay. There's two basic kinds of streams in  
14 relation to groundwater. One is a gain stream where water  
16:55:16 15 is coming out of the ground into the stream and  
16 conversely, you have a losing stream where water leaves  
17 the stream into the ground. Under natural conditions,  
18 there was a lot of gaining going on, and recently, because  
19 of the water use lowering water levels, we've got a lot of  
16:55:35 20 losing streams.

21 Here is the watershed of the study area.  
22 This is the Gila River watershed. It goes all over into  
23 New Mexico. I haven't shown the part of it in Mexico, but  
24 it's down here. The Santa Cruz and part of the San Pedro.  
55:59 25 You have the Verde, the Salt, the upper Gila, the South

1 American Pedro, the Santa Cruz, the upper part.

2 Okay. And here's watershed. This is the  
3 study reach, a 188-mile long reach of river from the  
4 confluence of the Salt on down to the Colorado River.

16:56:33

5 It's very large. It's 43,500 square miles at the upper  
6 end and 58,200 to the lower end and half the size of the  
7 state of Arizona, and it includes a major watershed.

8 Okay. Geologically it's cut into old  
9 terrace material, so generally it's in a degrading  
10 condition.

16:57:04

11 This is the lower part, this is the area of  
12 the rear that we're talking about, and it is basically the  
13 drainage area down there. The precipitation in this area  
14 is very low, it's three, four inches down in the Yuma area  
15 and up -- Phoenix, it's about seven inches. The few  
16 scattered mountains in here, it might be a little more.  
17 You do get some mountain front recharge into the ground  
18 that in the old days would make its way to the river. And  
19 you do get some surface runoff in that area, not very  
20 much.

16:57:18

16:57:36

21 Here's a USGS map, perennial flow stream map  
22 for Arizona. It's produced by the Arizona Game and Fish  
23 and the USGS back in 1978, and it shows the flow is  
24 perennial prior to diversion and impoundment or decline of  
58:01 25 groundwater levels in our study reach of the Gila River.

1 That's from the little rotating stars or suns on each end  
2 there.

3 Okay. Here is the water time line. The  
4 population growth going from almost nothing to five  
16:58:23 5 million plus -- and that's for the state of course. And  
6 what I'm looking at here is I'm calling natural  
7 predevelopment a period -- or roughly prior to 1860.

8 Let's take a look at what happened here. Let's take a  
9 look at the irrigation diversion dams and stock dams --  
16:58:44 10 stock tanks and so forth, and then we'll go on in and look  
11 at some large dams.

12 So here's a predevelopment when the Indians  
13 were the only ones around. Okay.

14 And there is a depiction from American  
16:59:03 15 Society of Civil Engineers magazine what they might have  
16 looked like and the old canal. Okay.

17 Then here comes the White manual. The  
18 famous Swilling -- Swilling ditch in Phoenix in 1868.  
19 This other famous Salt River Project scene with the guy  
16:59:31 20 guarding his headgate.

21 Here is a 1905 map from the USGS  
22 publication, one of the earliest made in the state, and it  
23 just shows a lot of canals in the Phoenix area. There was  
24 a lot of water being diverted in 1905. Okay.

59:51 25 Here's a view looking upstream near the

1 Roosevelt Dam site in 1905 on the Salt River.

2 This is where ASU is, right down there where  
3 those fields are, in 1905, and the Salt River is just to  
4 the left. So this is where all the diverted water was  
17:00:08 5 going, into agricultural use. Okay.

6 This is a rock diversion dam. This is on  
7 the ditch that I have a water use right, it goes back to  
8 1867, that there were other diversions prior to that by  
9 the military at Camp Verde. But anyway, there was many of  
17:00:33 10 these types of diversions since about, roughly, 1860.

11 Here's a couple of more. And then here's the Gillespie  
12 Dam. Okay.

13 Many thousands of stock tanks. I think  
14 there's over 18,000 in the state that have applied for  
17:00:57 15 permitting through AEWB, and there's probably, but anyway,  
16 there were a lot of stock tanks that started back in the  
17 old days. And also damming of springs and so forth for  
18 other uses. Okay.

19 Here we have the area of large dams.

17:01:19 20 Roosevelt Dam just before statehood. I think it started  
21 impounding water in roughly 1909 and got serious about it  
22 in 1911.

23 Here is the three dams on the Salt plus  
24 Coolidge Dam, the two on the Verde. Painted Rock and  
:01:45 25 Gillespie and the one up at Lake Pleasant there --



1 McMacon, is it? This just shows things are changing, very  
2 deep wells, et cetera, et cetera.

3 Here is some recreation -- just a couple of  
4 people in audience that can relate to that, I know. But  
17:02:11 5 here is recreation on the Salt, the Gila, and the Verde,  
6 all above the large dams. And a little commercial  
7 operation in Camp Verde.

8 Here's a quick look at some of the USGS  
9 gauging stations, and we'll be looking at dry-weather  
17:02:39 10 flow, but of course, all the flow we're looking at here is  
11 effected by diversions.

12 The upper Gila. Okay, let's just go through  
13 them pretty fast. Middle Gila. Blue River. San Pedro.  
14 Tonto. Salt, Roosevelt. Salt Prisapeal in the canyon  
17:03:05 15 there -- Salt River Canyon. Verde, that's 23 CFS. Camp  
16 Verde. And here we are down near the Tangle Creek gauge  
17 right about Horseshoe. Okay.

18 Okay. We'll take a closer look at the  
19 hydrology now.

17:03:25 20 We have a large number of alluvial basins.  
21 They are significant in assessing navigation. Plus all  
22 along the Mogollon Rim here, we have got a massive  
23 sandstone aquifer that underlies basically all of the  
24 little Colorado River basin and then it's exposed along  
03:54 25 the rim and water from it recharges and goes down through

1 into the limestone below and a lot of it makes its way  
2 into the Gila River watershed. And just to orient you  
3 here, this thing goes all the way to Silver City, New  
4 Mexico. It's a big watershed and it drains some beautiful  
17:04:21 5 high country with a lot of snow.

6 And speaking of snow, here's the NRCS snow  
7 sites up here along the rim and around Baldy and around  
8 San Francisco Mountains. So this is where we get a large  
9 snow pack and then a lot of spring runoff. Back in the  
17:04:46 10 old days it would make its way right down through the Gila  
11 and on into the Colorado. Okay.

12 Here's a little cartoon that kind of shows  
13 what's going on along the Mogollon Rim. You got your  
14 precip and then you got your huge Coconino aquifer, you  
17:05:08 15 hear it called sea -- sandstone, red wall limestone --  
16 excuse me, limestone, red wall limestone and so forth.  
17 And water basically just seeps all the way down. It moves  
18 rather slowly and so forth. Okay.

19 Let's just take a quick look at Fossil  
17:05:37 20 Spring. This is 43 cubic feet per second. It has been  
21 flowing that as long we know. Just about as steady as --  
22 just 43 all the time. Okay.

23 Here is a quick look at Horton Creek. It  
24 drains the Coconino sandstone. And Cibecue Creek, it  
05:54 25 originates in the limestone.

1                    Now let's take a look at these alluvial  
2 basins. You know they would be Little Chino Valley, Big  
3 Chino Valley, the Verde Valley, and so forth, Safford  
4 Valley, all the different valleys. And as you come down  
17:06:09 5 the major rivers, the Salt, the Verde and the Gila River,  
6 the river passes through these alluvial basins surrounded  
7 by mountains and so forth, and the groundwater also moves  
8 from one to the other. So everything is interconnected.

9                    And you can look at a little water budget  
17:06:39 10 here for a representative basin where you have a recharge  
11 and evapotranspiration, groundwater coming in, groundwater  
12 coming out. Maybe perennial stream flow losses to the  
13 aquifer or vice versa. And then your perennial flow out.  
14 Okay. And in the early development, there were wells  
17:07:09 15 developed along these streams. There were many  
16 diversions, many dams. The result is the groundwater  
17 level started to drop and gaining streams became losing  
18 streams. So during spring runoff, these basins were  
19 filled, and during dry periods, the water drained away  
17:07:40 20 back into the river. It was kind of like a savings  
21 account. You had plenty, you put it in the bank and when  
22 you needed it, it would come out.

23                    A couple of rather poor quality photos of  
24 these alluvial basins, but just to show you, there's some  
07:55 25 differences in them. Here's one up in the Gila, lava

1 farming. A couple more. Here you've got a little spring  
2 runoff and water flowing out into some farm land. So the  
3 Gila River was supplied by many springs in the upper  
4 watershed, and many of them originated up in the Mogollon  
17:08:24 5 Rim. Also -- next slide -- and many springs that  
6 originated in the alluvial basins all over the place.

7 Okay. Now, this is important. Because of  
8 this huge amount of groundwater stored in these basins and  
9 then slowly released during summer period, the flow  
17:08:57 10 probably did not change much along the study area because  
11 of this massive supply of water. It was millions and  
12 millions of acres of water in storage then. And before  
13 the water levels were lowered, it drained out into the  
14 river. Okay.

17:09:21 15 So in predevelopment, you had alluvial  
16 basins or at least hydrogeologic areas that some -- people  
17 them. Typically, we're hydraulically connected to  
18 streams, predominantly through soils and also through  
19 basin fill. And just to emphasis this a little bit, this  
17:09:43 20 is just to show that a gaining stream where you have  
21 groundwater coming into the stream -- okay, next slide --  
22 and development such as wells in the valleys -- or this  
23 could also represent a diversion dam or whatever, but  
24 development changed everything and the stream -- water  
:10:04 25 from the streams went out into the ground. I'm kind of

1 describing the subflow issue here too. Go ahead.

2           So in predevelopment, we have a lot of  
3 runoff going into the lower Gila River. Verde, 25 to  
4 30 inches a year up in here, lots of snow pack and so  
17:10:28 5 forth. Also, you have a large number of very steady  
6 flowing springs up here, the one that drains Big Chino and  
7 Mormon Pocket and Fossil Creek and the one down at the  
8 start of the Salt right below where the Black and White  
9 River come together. There is a huge spring in there  
17:10:51 10 that's -- they are all very steady. Okay.

11           So now we get into the report. The  
12 hydrology, hydraulics, and the navigability. And go  
13 through in it steps because the subsequent steps are  
14 dependent on, let's say, the hydrology. Okay. So my goal  
17:11:18 15 is to estimate the amount and temporal distribution of the  
16 natural flow in the Gila River for this study reach. And  
17 to do this, I'm focusing on the main, the median, and the  
18 base flow. And I'll show you how I use those later.

19           Okay. Two primary sources of information  
17:11:42 20 for the hydrology are these two reports produced by the  
21 USGS. This is predevelopment hydrology on the Gila River  
22 Indian Reservation, so this is basically right above where  
23 the confluence with the Salt. And then here's a like one  
24 in the Salt River right near its mouth.

:12:06 25           Let's go to next one.

1 So in these two publications is an  
2 exhaustive analysis of more than a hundred years of stream  
3 flow data at several sites, and basically, all the stream  
4 flow data available that pertained to the estimate of the  
17:12:36 5 natural runoff at these two points.

6 I also used triggering data and long-term  
7 precipitation data and estimates of the effects of  
8 development. As far as I'm concerned, this is best  
9 technical data available for this analysis.

17:12:55 10 This is just an example of how you might  
11 use -- or how precipitation data was used. You kind of  
12 look at any climate -- or any trends and so forth and then  
13 make adjustments if up. What they were doing was focusing  
14 on the hundred-year period before 1870. Okay.

17:13:22 15 An example of dendrochronology, I did work  
16 with the University of Arizona people so you have  
17 tree-ring width here versus time. And they did some  
18 comparison with it to make sure they were on the right  
19 track and it wasn't some kind of climate trend of  
17:13:45 20 something eating them up.

21 Now the base flow came from the report by  
22 Freethey and Anderson, and this is what defined the water  
23 budgets for all the alluvial basins in the basin and range  
24 physiographic problems. So you take those water budgets  
14:09 25 and add them all up and you come up with a base flow down

1 through the study reach. That's my worn and tattered copy  
2 of it -- or the cover for it. Okay.

3 So there they are, the three reports that  
4 were the basis for the hydrology of what I did. Okay.

17:14:40 5 And that's the hundred-year period before 1870 is what  
6 they said it applied to, and I'll let you read that.

7 So basically what they determined was that  
8 the Indians along the Salt had been there for a long time.

9 The Indians along the Gila weren't using a significant  
10 amount of water to -- the amount wasn't significant for

17:15:13 11 their analysis. And I guess there was some uncertainty  
12 with it, and so they assumed that the Indians were not

13 using any water. So these produced a long-term mean,  
14 median, and base flow.

17:15:43 15 The evaluations took into account a heavily  
16 vegetated area -- or heavily vegetated riparian areas in

17 both of the reservations, but in particular, the Gila  
18 reservation. And they extracted, from this estimate,

19 250,000 acre foot per year that was lost to ET. Okay.

17:16:10 20 And here are the estimates. At the confluence of the  
21 Salt, the mean 2,330; the median, 17,500; and the base,

22 290. This is before development.

23 And down at the mouth, I kept the mean and  
24 the median the same because the losses to ET seemed to be

:16:44 25 balanced by the inflow from that rather arid area, but

1 there was definitely a loss in the base flow. Instead of  
2 290 down to 170. Okay.

3 So here is the estimates of the mean and the  
4 median, and then for my own edification, I did three quick  
17:17:10 5 checks using USGS hydrologic unit maps on these first two  
6 methods down here in the bottom in green. And USGS has  
7 published runoff for hydrologic units for the entire  
8 country, so that was real easy information to get ahold of  
9 and I used it. What you have to do is make estimates of  
17:17:41 10 transmission losses as the flow crosses these different  
11 alluvial valleys.

12 And I used two different methods to estimate  
13 that, so that's why I have two different numbers there.  
14 The last check is Corps of Engineers report 1952, I think,  
17:18:11 15 on the lower Colorado River. And they had a number of  
16 1,800. And I'm not sure if that's a clean number in  
17 regard to predevelopment, there might be some losses to  
18 development in there. I'm not sure. But anyway, there is  
19 the number. In any event, there's pretty good general  
17:18:22 20 agreement. Okay.

21 Now, a good way to explain this data in  
22 terms of the issue -- and that is navigation, could it  
23 have occurred -- is the flow duration curve. Did -- "a  
24 cumulative frequency curve that shows the percent of time  
:18:45 25 specified discharges were equaled or exceeded during a



1 given period." And let's look at a big view of it. Next.

2           And there's a flow duration curve and this  
3 is -- you can think of this as reconstructed flow. This  
4 is what it was back in the old days. And here is where  
17:19:13 5 the median point plots 50 percent of the time. We have  
6 the 1700. Base flows down here. There's two base flow  
7 points, the upper and lower reach. And then you draw a  
8 line here that corresponds to the mean. And you fit the  
9 curve through this information -- let's go to next slide,  
17:19:31 10 and I will show you how -- you hold the curve on this  
11 point and the two points down here for the basins. And  
12 then the area of this curve here has to equal the area  
13 here. So you just graphically fit it through -- or I use  
14 a computer and knocked it out -- but in reality these  
17:19:55 15 curves are smooth. This has little break points in it,  
16 but just kind of think of it as a nice smooth curve.

17           So this shows that the river was perennial,  
18 and it shows the distribution of flow throughout the year.  
19 90 percent of the time it was at least this base flow  
17:20:17 20 amount of either 179 near the mouth or 290. Up here, it's  
21 at least 1700 and whatever at the median, and the mean  
22 here plotted roughly at 37 percent, so 30 percent of  
23 the -- 7 percent of the time the flow was at least 25, 30.  
24 And that just shows -- I already showed that -- this  
20:43 25 technique has been used by engineers -- I guess you would

1 say only old engineers might use it now, but I'm one of  
2 them, and it's very good technique for doing something  
3 like this.

4 Okay. Now we have the hydrology defined.

17:21:02 5 Next step is to define the natural hydrologic and  
6 morphologic characteristics. In other words, let's take a  
7 look at the shape of that channel, the size of it and the  
8 shape of it, and the velocity. It's a deformable alluvial  
9 channel, like the Mississippi and like many, many other  
17:21:29 10 channels in the United States and in the world. So the  
11 size and the shape formed by the sediments and the flow of  
12 the river.

13 Here are the two primary publications I used  
14 for this. The first one is by Osterkamp.

17:21:51 15 Sediment-Morphology Relations for alluvial channels. In  
16 particular, cornel flow alluvial channels, i.e., base  
17 level streams mostly, not piedmont streams.

18 I used that method to determine the width  
19 and then the second method, by Burkham, I used to  
17:22:13 20 determine the depth and the velocity. And here's a couple  
21 of tattered pages of those publications, but I have them  
22 here if anybody wants to see them.

23 I also used standard methods -- standard  
24 hydrology methods. This is an old hydraulic geometry  
:22:40 25 publication by the USGS. Let's go to next one. Here's a

1 Corps or Engineers publication that uses it. Here is a  
2 example of where it's used in the Mississippi River basin.  
3 Here is a study in Australia. So it's a well-proven  
4 method and it's used all over the world.

17:23:02 5                   There is just a sketch of what -- I want to  
6 make sure that everybody understands what we're looking  
7 at, a base flow level here, a median flow level here, and  
8 a mean annual flow level up here. Okay.

9                   And here is the sketch of the width; the  
17:23:30 10 maximum depth, which is little  $D$ ; the mean depth,  $D$ ; and  
11 the areas with times mean depth.

12                   Okay. Now this is a hydraulic geometry  
13 relation, that's what it's known as. It's also known as a  
14 power function. But this is what these relations looked  
17:23:53 15 like. And this is -- width is equal to mean annual flow  $Q$   
16 which is -- you can think of it as a discharge -- with  
17 this coefficient  $A$  and exponent  $B$  which are related to the  
18 sediment characteristics of the channel. So all of this  
19 is a mathematical relationship that's been derived  
17:24:21 20 empirically but it has a strong hydraulic geomorphic basis  
21 to it.

22                   And I went out and collected sediment  
23 samples all along the river. Kicked dirt. Okay. Did  
24 many particle size distributions. This is the particle  
24:40 25 size in millimeters versus the cumulative percent of the

1 particles finer than the indicated size, so this is kind  
2 of like a flow duration curve, but it's a little  
3 different, same idea.

4           Also used all the available soil survey  
17:25:01 5 reports which covered the entire reach. And in those are  
6 particle size analyses of the sediments and the  
7 description of the sediments along the river. Okay.

8           Here's a couple of examples of the power  
9 function just to show the difference you get when you have  
17:25:22 10 a sand bed with silt banks. This is the relation for the  
11 Gila River. And if you had just a gravel channel, then  
12 this is the relation. Okay.

13           From the range of sediment I found in the  
14 Gila, I came up with five different relations for the bed  
17:25:44 15 material shown there, all way from median silt clay on up  
16 to gravel. And I computed a width for each one of those  
17 and took the average and came out 300 feet, all using  
18 methods by -- the method by -- as defined by Osterkamp.  
19 Okay.

17:26:07 20           So Manning's equation was next used by a  
21 parabolic twist that matches the hydraulic geometry  
22 technique was incorporated by Burkham, which I followed,  
23 and from that, I computed the shape of the channel and the  
24 depth and velocity.

:26:29 25           And there's what this channel looks like.

1 It's actually much wider than indicated here. You got to  
2 pay special attention to scale, zero, 100, 200, 300 feet,  
3 and the depth incriminates here are 1 foot. So it's a  
4 pretty wide channel. I'm talking about the main channel.  
17:26:55 5 Now, beyond -- up above here 5 or 6 foot, it will start to  
6 spread, that's where your floodplains will start,  
7 somewhere up there. I don't care about that for this  
8 analysis.

9 CHAIRMAN EISENHOWER: Reconvene.

17:36:17 10 MR. HJALMARSON: The mean annual flow of  
11 2,330. We have -- the width is 300, that's an average  
12 like I showed you. Mean depth 3.1, and mean velocity of  
13 2.5. The estimated maximum depth is 4.8. The -- and here  
14 is a width duration curve for these computations, and it  
17:36:46 15 just shows the percent of the time that the width on the  
16 upper part or the lower part was greater than the amount  
17 indicated over here, like the width of 300, it's -- come  
18 down here and it's 30 something percent. And for a width  
19 200, you could come over and down, and roughly 80 percent  
17:37:17 20 of time, it was at least 200 and so forth. Okay. And for  
21 the median, it's about 270 feet, so 50 percent of the time  
22 it was greater than that.

23 And here's the velocity duration for the  
24 same type of thing. Really you don't have to look at this  
17:37:30 25 in detail. What it really shows is that the velocity is

1 quite mild and amateurs can put boats on that river most  
2 of the time. Okay. And here is the depth velocity  
3 relation at a velocity, say, of 2 for the upper, the depth  
4 would be a little over 2 feet, and so forth. So it just  
17:38:02 5 gives you a feel for what was out there. Okay.

6 Now back to the flow duration curve. This  
7 shows the base flow here, it shows the width on the upper  
8 part of the reach, the mean depth, and the velocity, and  
9 the median, the same thing. And at the mean. So it just  
17:38:31 10 gives you an idea of what's there and showing the  
11 discharge too. Okay.

12 The same relation now showing the maximum  
13 depth. Now, the maximum depth represents the depth of the  
14 center of the channel and quite a large part of it. Okay.

17:38:58 15 Now, this is kind of geomorphology -- you  
16 might call it geomorphology hocus pocus or whatever if you  
17 are not familiar with this method, so this is a check of  
18 what I did. Okay. Let's to go next one.

19 Now, using the land surveys that we've heard  
17:39:29 20 so much today, I went in and examined the surveys, and I  
21 found 122 surveyed widths for the period 1867 to 1992, and  
22 of course, all of this is in the study reach. This is a  
23 listing of those widths, and I have arranged them in  
24 increasing order. So the smallest one I found was 104 and  
40:00 25 it goes on up to almost a half mile wide.

1 cosecant theta. Okay. So just to rehash here, this is  
2 the power function that was used to determine this width.

3 Now, the power function relation is this red  
4 dashed line, the surveyed ones are this. Now, how do we  
17:42:21 5 relate this? We don't know theta, but we have a relation  
6 to work with. Okay.

7 That's just a summary of what I've said.  
8 Okay.

9 So the channel was meandering. It was going  
17:42:49 10 in a generally western direction but also south. And it  
11 looked like the angle theta could be anything from zero to  
12 almost 90 degrees. So therefore, an equal likelihood of  
13 the angle theta was assumed. This is how you express this  
14 mathematically in a probability function. And the  
17:43:08 15 integral that I used for this analysis was one degree. So  
16 B would be one degree more than A over the range from zero  
17 to 90 degrees. Okay. And this is just a mathematical  
18 representation of that. So we have this computed  
19 relation, now let's see if we can make it equivalent to  
17:43:37 20 the surveyed widths.

21 Here is the computed relation. I broke it  
22 into 10 equal increments of percent of time excluding the  
23 upper end here because this is the area where overbank  
24 flow could be occurring. And mathematically, this is  
43:56 25 expressed here. Here's the width and we have 10 points.

1 N equals 1 to 10. And we're going to assume the angle  
2 could be anything from zero to 90 in one-degree  
3 increments, so we're going to have 90 pages for each one  
4 of these 10 points or a total of 900 estimates of the  
17:44:21 5 surveyed widths. Okay. And here is the result, this  
6 pink-dashed line versus the surveyed widths. These are  
7 done completely independent, and that's an excellent check  
8 of the hydrology -- hydraulic geometry methodology.

9           When you consider that the hydraulic  
17:44:50 10 geometry produces a long-term average and the surveyed  
11 widths are a relatively short period of time and when  
12 water was being extracted from the river, this is  
13 especially good agreement. Okay.

14           So in this hydraulic geometry method, I have  
17:45:18 15 basically made the assumption that the Gila River was a  
16 single meandering channel, let's see if it was. This just  
17 demonstrates the problem -- and I think Dr. Schumm covered  
18 this a little bit today, but let's -- there's a balance  
19 here. You've got sediment size versus sediment load  
17:45:29 20 versus water discharge versus slope of channel, and all  
21 those have to stay in balance, and if something changes,  
22 then the scale moves and the dial goes either towards  
23 aggradation or degradation. So the thing is in a state of  
24 imbalance when you change something. Okay.

45:50 25           I'll let you read that. So the morphology



1 is self-formed. There's few hard rock controls, and the  
2 channel is formed of material that was basically  
3 transported by the river itself and deposited by the river  
4 and its tributaries. So I'm going to use four relations  
17:46:28 5 that show associations of the different variables that  
6 people have developed and that are generally used by  
7 morphologists and engineers doing this kind of stuff.

8           The first one is the Leopold-Wolman  
9 Association developed back in '57. Let's just go directly  
17:46:53 10 to the relation. It shows a relation between bankfull  
11 discharge or mean annual flow and channel slope. The mean  
12 annual flow from the Gila is right here, 2,330, and the  
13 range of slope is shown here, so this little line here  
14 represents the Gila River. On the lower part the line,  
17:47:21 15 this line here, rivers are meandering, and above that line  
16 they're braided, so it's meandering.

17           Okay. Here is the Parker Association, a  
18 little more recent. Let's go right to the relation. This  
19 is the width-depth ratio shown here -- actually, it's the  
17:47:40 20 inverse of it, it's the depth-width ratio, really. And  
21 then the slope divided by the foot number -- the foot  
22 number is a measure of the velocity and the state of the  
23 flow. The Gila plots right in this area and you use this  
24 curve like this, you come down parallel to these  
48:02 25 relations, so you have a point here, you come down, and

1 you run into meandering. Okay.

2 Third method, the Bledsoe and Watson  
3 Association. And let's go right to it. This one shows  
4 sediment -- the median sediment diameter. The Gila was in  
17:48:23 5 this range here. And then the slope times the square root  
6 of the discharge, the mean annual discharge and that plots  
7 in this range here, and this circle basically encompasses  
8 the entire lower Gila and it's in the meandering zone as  
9 opposed to say braiding, which of course it is now.

17:48:47 10 Okay. And here is the Schumm-Khan  
11 Association. Let's go right to it. This is a very simple  
12 relation, but it shows -- what you do is you get the slope  
13 of your river, and the slope is within this range about 5  
14 to 6 feet per mile in the upper part and about 3 foot per  
17:49:15 15 mile in the lower part near Yuma, maybe down right near  
16 the Colorado closer to 2, so right in this range here, you  
17 have the Gila and you just simply go up to this relation  
18 right here and see what you got. It's right on the lower  
19 end of the meandering. It's definitely not up here in the  
17:49:31 20 braided. And it also suggests that the sinuosity was low.  
21 Okay.

22 So this is just a generality about the  
23 pattern is a function of the stream power, the gradient,  
24 and sediment load. And like I say, it suggests the low  
49:59 25 sinuosity so there's not a whole lot of meandering here.

1 A real high sinuosity would indicate the thing was going  
2 around like that. It's really going -- really meandering  
3 around. There's not much to it. And as far as I'm  
4 concerned, that's what it's got, that's what we have down  
17:50:22 5 there. I've examined the plots of the river and most of  
6 them look very similar to this, got straight stretches  
7 with just slight meanders.

8 Now, another thing that was in the federal  
9 surveys was notations of a lot of cottonwood and brush and  
17:50:38 10 mesquite along the banks of the river. And of course,  
11 this -- you have to have a stable river to get vegetation  
12 established. And then once it's established, it in turn  
13 stabilizes it. And then once it's stabilized, then you  
14 get processes like donoring, the fine sediments go into  
17:51:02 15 the banks and the thing becomes more and more stable. And  
16 then once in a while a big flood comes along and tears it  
17 all out and Mother Nature starts all over again.

18 By the way, we had several notations this  
19 morning of very large willow and cottonwood, 10 inch right  
17:51:21 20 at the water's edge, 6 inch and 8 inch, I remember this  
21 morning. Okay.

22 Let's see, wait a minute.

23 Can you go back? Well, the significance of  
24 that -- significance in regard to navigability is the  
51:48 25 channel was meandering, and such a channel is relatively

1 stable as opposed to say braided, so it's easier to  
2 navigate on. And the method I used is super power  
3 function and the use. Okay.

4 So let's look at navigability under natural  
17:52:09 5 conditions. Now we're using the hydrology and we're using  
6 the hydraulics and morphology that I have shown. Was the  
7 Gila River navigable? Okay. I used three independent  
8 federal methods. The first is a Bureau of Outdoor  
9 Recreation. There is a very simple method that basically  
17:52:40 10 says that if you have a minimum depth of 1 foot and a  
11 minimum depth of 6 foot, for recreational craft you can  
12 use it. We have a minimum depth of about a foot and a  
13 half during the low base flow and on up well above 1 foot,  
14 and the width is generally more than 150 feet. So easily,  
17:53:16 15 easily pass that test. Okay.

16 Here's the second test. And this is Bureau  
17 of Outdoor Recreation. And here's the gradient in feet  
18 per mile versus discharge. This is where the base flow  
19 plots the median and mean. They all are in class 1, which  
17:53:36 20 means even old guys like me might be able to navigate it  
21 easily -- and it's easy. And it shows, as you increase  
22 discharge, of course, it can become more and more  
23 difficult and at high flows it could become treacherous,  
24 but not much of the time.

54:00 25 Third method is more of an engineering

1 application produced by the USGS by one the best  
2 geomorphologist engineers that I am aware of, Walter  
3 Langbein, "Hydraulics of River Channels as Related to  
4 Navigability." Okay.

17:54:25 5 And I'm just going to show you, this is a  
6 full-blown engineering analysis where forced diagrams were  
7 used, and this is a vessel going upstream. And of course,  
8 for this assessment of navigability, all we need to do is  
9 have the vessel go downstream. This method takes one

17:54:54 10 unnecessary step, but interesting. Let's take a look at  
11 what it does. It uses the hydraulic geometry attributes,  
12 although I've already computed those, so I was drawn to  
13 it. And this shows the relation between hydraulic  
14 geometry of a vessel versus a river, and these

17:55:19 15 characteristics are combined. Okay.

16 If tractive force of a moving vessel is  
17 used,  $T(s)$  -- this is thrust divided by weight -- and this  
18 really becomes a dimensional number. It's kind of a  
19 unit thrust thing where this is the thrust that just  
17:55:41 20 starts the vessel to move, so it's at an equilibrium  
21 point. So it doesn't matter what kind of vessel we're  
22 talking about.

23 This is just another equation showing  
24 tractive force. Tractive force is a function of the drag,  
56:05 25 draft, squat, size, weight, and speed of the vessel and

1 the slope, velocity, depth, and specific weight of the  
2 water in the river. Okay.

3 Here's a table from that report, and I am  
4 showing the Gila River where it fell. You've got the  
17:56:23 5 Mississippi River evaluated up here. Right above the Gila  
6 is the Red River and below is the Missouri, Green,  
7 Yellowstone, and so forth, and it falls right in here with  
8 this tractive force.

9 And here is a plot of it, this is velocity  
17:56:42 10 in feet per second. You will probably see some  
11 similarities in velocity in what I have already shown you.  
12 This is where it plots here with channel depth over here.  
13 And here it is with the Mississippi way up here, and it  
14 shows -- this clearly shows that it's navigable, upstream  
17:57:09 15 and downstream. Okay.

16 So studies based on published information,  
17 standard engineering methods, systematic three-step  
18 method. They are going through the hydrology, the  
19 hydraulics, morphology, which is basically the shape,  
17:57:28 20 roughness, slope of the channel, and we looked at the  
21 navigability.

22 Okay. For all alluvial channels like the  
23 natural Gila River, the Mississippi, you name it, big  
24 floods can suddenly disrupt the channel. Over time, the  
17:57:48 25 channel will gradually recover or heal as smaller flows

1 reworks the mobile bed and so forth. Now if you take away  
2 the flow, like what happened to the Gila, it's not going  
3 to heal. So in 1891 you have a big flood, all the flow is  
4 diverted, and river just sits there all torn up. It's not  
17:58:06 5 going to heal itself. When you start putting dams in, it  
6 gets worse and worse. So it's completely different than  
7 it was. Okay.

8                   So the evidence suggests this following  
9 natural channel, it's a low gradient, as Dr. Schumm showed  
17:58:27 10 this morning, higher gradient ones can be braided. This  
11 is quite low. "Well-defined alluvial channel slightly  
12 entrenched in well-defined floodplains covered with brush  
13 and trees. Valleys are broad with high terraces.  
14 Slightly meandering channel with some riffles and pools."

17:58:50 15                   In terms of modern boats, or old ones there  
16 too, canoes, drift boat, rowboat up there, almost all the  
17 time you could put one on. Depending on your skill, you  
18 make the call, but you could take it up here if the higher  
19 flow.

17:59:05 20                   Power boats on there at about 70 percent of  
21 the time, that's where the depth could be greater than  
22 3 feet. Okay. This is how the base flow might look in  
23 the cross section and there's a raft and some boats,  
24 canoe, and so forth. 12, 14 foot, easy. Okay. And then  
59:41 25 power boats for median flow, catamaran, that kind of

1 stuff. Okay.

2 This is just a review of what I showed  
3 earlier. This shows width, depth, and velocity for  
4 distribution of flow for the various flows.

18:00:04 5 My opinion, "the Gila River, from the  
6 confluence with the Salt ... to the mouth at the Colorado  
7 River was susceptible to navigation at the time of  
8 statehood ... in its ordinary and natural condition using  
9 the federal standard."

18:00:22 10 That's it.

11 CHAIRMAN EISENHOWER: Any questions?

12 COMMISSIONER HENNESS: No.

13 COMMISSIONER ECHEVERRIA: No.

14 CHAIRMAN EISENHOWER: Mr. Hjalmarson?

18:00:54 15 MR. HJALMARSON: Yes.

16 CHAIRMAN EISENHOWER: We have some questions  
17 for you.

18 MR. HJALMARSON: Okay.

19 (Mr. Hjalmarson is answering questions.)

18:00:54 20 BY COMMISSION COUNSEL JENNINGS:

21 Q. Mr. Hjalmarson, I understand you consider, for  
22 purposes of your report, the ordinary and natural  
23 condition to be without any diversions and without any  
24 groundwater pumping?

01:07 25 A. That's true.



1 Q. In other words, a completely virgin country that  
2 man has never set foot on?

3 A. Yes.

4 Q. Well, then, I'm curious, why do you limit your  
18:01:23 5 period of time to pre-1970? Why don't you go back to 2000  
6 years ago or, say, 300 AD?

7 A. Very good question, however, I'm locked into the  
8 hydrology methodology that I chose to use, and that's what  
9 they state in their reports. However, you can take a  
18:01:51 10 small leap of faith and say, "All right, that's the way it  
11 is."

12 But here is the caveat to that, is they  
13 looked at climate trends and so forth and said. "All  
14 right, we're safe in projecting back that far." Now, it's  
18:02:03 15 possible that we had a different climate not too long ago.  
16 And so with that in mind, you know I'm looking at a virgin  
17 situation, like you say, but we have got to be realistic.  
18 We know the climate is changing and so it varies from time  
19 to time.

18:02:26 20 Q. How much effect on the flow does groundwater  
21 pumping at the present rate we're pumping have on your  
22 figures? Or can you give an estimate? That's a tough one  
23 to answer with precision.

24 A. Well, one way to answer that is the more that is  
02:57 25 withdrawn and the more lowering of groundwater levels you

1 have the harder it would be to bring the river back to  
2 where it was. If you did away with all the dams and  
3 everything and tried to put it back in place like was  
4 talked about earlier today, then it would become more  
18:03:14 5 difficult. But the bulk of the change has already  
6 occurred and additional pumping isn't going to change it  
7 much more.

8 Q. But the pumping that has already occurred over  
9 the last, let's say, hundred years has made a significant  
18:03:37 10 difference in it?

11 A. Yes. Basically what it did is it changed the  
12 streams from gaining to losing, using the cartoons and so  
13 forth that I have shown. That's basically what's  
14 happened.

18:03:56 15 COMMISSION COUNSEL JENNINGS: Thank you.

16 CHAIRMAN EISENHOWER: Is there anybody else  
17 in the audience that would like to question  
18 Mr. Hjalmarson?

19 MR. MCGINNIS: Yes.

18:04:05 20 (Mr. Hjalmarson is answering questions.)

21 BY MR. MCGINNIS:

22 Q. I'm Mark McGinnis on behalf of Salt River  
23 Project. I guess to start off with -- and I apologize if  
24 I butcher your name. I'll probably say it about 10  
04:12 25 different ways.

1 A. Call me Gus.

2 Q. Gus? How about doctor, that will work?

3 To start off with, Doctor, I would like you  
4 to tell me --

18:04:26 5 A. I'm not a doctor.

6 Q. You're not. I thought you were. Okay.

7 A. I'm a P.E.

8 Q. You're a P.E.

9 Okay. Gus -- it's getting late -- can you  
18:04:34 10 tell me what actual data from pre-1912 you used in doing  
11 your analysis?

12 A. Pre-1912, what I relied on, on the hydrology, is  
13 the analysis done by my USGS colleagues on those three  
14 reports. They used all the stream flow data available.

18:05:01 15 Some of it -- I think Verde Bartlett goes back to the late  
16 1800s, and there's two other stations that go back what  
17 were -- where you have well over a hundred-year period of  
18 record and goes well before statehood. And I think Gila  
19 Dome goes back before statehood and a few others.

18:05:29 20 Q. When you say "Gila Dome," what are you referring  
21 to? I mean, I know where Gila Dome is, but what data?

22 A. USGS gauge there called Gila River near Dome.

23 Q. So other than flow data, is there any actual data  
24 that you used in your analysis that was from prior to --  
05:46 25 1912 or earlier?

1 A. Yes. I didn't cover it in my talk, it's in my  
2 report. One example is the use of the U.S. Geological  
3 Survey topo maps and a few of those go back to 1903 and  
4 '04 and I did examine those.

18:06:08 5 Q. Anything before 1900 in terms of those maps?

6 A. Not that I can remember.

7 Q. Is there any other data before 1912, other than  
8 what we have talked about, that went into your analysis,  
9 in your work here, actual data -- field data? Not that

18:06:30 10 you collected, but the data -- I'm not suggesting that you  
11 went back before 1900 and collected data. Could be  
12 secondary sources.

13 A. No. Nothing comes to mind. I'm not -- I looked  
14 at a lot of publications, but I can't recall.

18:06:47 15 Q. It's true, isn't it, that your work in this  
16 matter has been to deal with susceptibility of navigation,  
17 and you haven't spent any time determining whether things  
18 were actually navigated or not. Is that right?

19 A. That's right. I approached it from a hydrology  
18:07:01 20 engineering standpoint, and as I discussed here, it was  
21 based on the hydrology and the morphology and the  
22 hydraulics, all of which I'm well-versed in. I did the  
23 assessment independent of historic accounts.

24 Q. In the slide slow presentation or PowerPoint  
18:07:21 25 presentation you showed this evening, you had two slides

1 that were back-to-back. One was, what does 50 CFS look  
2 like? The other one was, what does 250 CFS look like? Do  
3 you remember that?

4 A. Yes.

18:07:31 5 Q. Okay. One of those, I think, was on the Verde  
6 and the other one was on the Salt?

7 A. Right.

8 Q. It's true, isn't it, that 50 CFS, for example,  
9 would look different depending on the -- on a different  
18:07:42 10 river?

11 A. Exactly. And they would definitely look a little  
12 different on the lower Gila. The lower Gila was a  
13 smoother channel, less gradient, so it would have a more  
14 tranquil-looking water surface, and so forth. But my  
18:07:57 15 reason for showing those was -- is to give the audience a  
16 feel for "What does 50 CFS look like?" A lot of people  
17 have no idea. So that was the purpose of it, as to kind  
18 of -- let's get all of us -- all of us get on the same  
19 page here, so roughly speaking.

18:08:13 20 Q. So 50 CFS in a channel that was 10 feet wide  
21 would be pretty deep, wouldn't it?

22 A. Yeah. Well, or moving awful fast.

23 Q. 50 CFS in a channel that was mile wide would be  
24 substantially less deep, wouldn't it?

08:31 25 A. Yes.

1 Q. One of the slides you showed in your presentation  
2 dealt with the base flow and things that, I think, looked  
3 like pans or something, if you remember. It says,  
4 "Because of the large amount of stored groundwater that  
18:08:53 5 supplied the base flow, the base flow may not have varied  
6 greatly from one year to the next." Do you recall that?

7 A. Yes.

8 Q. It's true that you don't know how the base flow  
9 varied, it's your assumption or your opinion that it may  
18:09:06 10 not have varied?

11 A. There is a basis for that. Unfortunately,  
12 there's not too many alluvial basins left in Arizona that  
13 haven't been pumped dry or diverted significantly and so  
14 forth. There are a couple you can look at to -- or let's  
18:09:24 15 say portions of the basins that have been gauged with  
16 streamform gauges, but one of them you can look at rather  
17 cleanly is the Big Chino Valley. And to give you a feel  
18 for how stable that flow is, or how steady it is, I can  
19 give you a guess right now, it's about 23 plus or minus 2  
18:09:53 20 CFS. And I can do that during dry weather year in and  
21 year out since we've been gauging it since 1960.

22 Q. But you don't have any data for before 1964 or  
23 certainly before 1912, even for the Big Chino flow, do  
24 you?

10:03 25 A. No. But what I'm telling you how a basin like

1 that behaves where you have a large amount of storage that  
2 hasn't been withdrawn. You get the same thing from Wet  
3 Beaver Creek in the Verde Valley, where there hasn't been  
4 much water use in its watershed and so forth, and you get  
18:10:21 5 a very similar-looking flow duration curve. The flow  
6 duration curve comes down and then just flattens off. And  
7 it's interesting, even during the drought years, basins  
8 like that, it stays -- it stays steady. Well, it drops a  
9 small amount, but it doesn't go dry. It doesn't even come  
18:10:39 10 close.

11 Fossil Creek is another one. It's flowing  
12 43 CFS now. As far as we know, it was flowing 43 CFS a  
13 thousand years ago. I don't know. But it sure hasn't  
14 changed since we've looked at it.

18:10:56 15 Q. But you really don't know what it looked like a  
16 thousand years ago?

17 A. No. But I know what it was a hundred years ago,  
18 just about what it is now.

19 Q. You didn't do any work in this case to determine  
18:11:06 20 the amount of water diverted by the Hohokam Indians, for  
21 example, or the Pima Indians back in the time before the  
22 arrival of the white man, did you?

23 A. No. Basically what I did was read the two  
24 reports that I showed you, the pink and the gray one. And  
11:23 25 in there, they discuss on one the Salt River reservation,

1 and the other one, the Gila River Indian Reservation. And  
2 I gave you a summary of what they concluded, and I went  
3 with that. I did some research on it. I took a look at  
4 it and -- let's put it this way, if somebody could give me  
18:11:53 5 when irrigation occurred and how extensive it was, whether  
6 they had all the woodland riparian vegetation there, like  
7 the studies assumed that I used either, et cetera, et  
8 cetera, then with that kind of information, I might be  
9 able to give some kind of estimate. But I couldn't find  
18:12:11 10 anything reliable and my colleagues, when they produced  
11 those reports, they said they couldn't either.

12 Q. So if you learned that the Hohokam, for example,  
13 or the Pima Indians later on had irrigated 5,000 acres  
14 before 1900, would that change your opinion that shows up  
18:12:30 15 in this report?

16 A. 5,000 acres? I would have to know some more  
17 detail. 5,000 acres, probably not.

18 Q. What about 10,000 acres?

19 A. Everything has a limit. Once you start  
18:12:57 20 increasing the magnitude of the possibility like where  
21 you're headed, then I have to have more -- I would have to  
22 have more information, just like I explained. One of the  
23 keys on this is, the USGS, when they did this, assumed a  
24 very large riparian area, from which 200 and 15,000-acre  
13:15 25 foot of water a year was lost to vapor. And that's



1 equivalent to a lot of farm land. So if you had Indians  
2 out there gathering wood and all that, and removing that  
3 riparian area and farming, then there is a tradeoff that's  
4 occurring. And you have to -- so you have to know what  
18:13:35 5 they were doing in order to assess that.

6 Q. You talk some in your presentation today about  
7 mean flow, median flow, and base flow.

8 A. Yes.

9 Q. I was just wondering if you could explain to me  
18:13:45 10 the difference between mean and median flows, for purposes  
11 of making sure we're clear on the record what it is?

12 A. Well, the mean is the average annual flow. The  
13 median is that which 50 percent of the time the flow is  
14 greater than that and 50 percent of the time it's less  
18:14:01 15 than that.

16 Q. You would agree with me that a river that has  
17 periodic large floods, that the mean can be skewed upward  
18 because of those occasional floods?

19 A. Well, what happens is like I showed on the flow  
18:14:14 20 duration curve, yes, the curve goes up and it steepens as  
21 the discharge increases, yes.

22 Q. Now, it's true, isn't it, that your analysis that  
23 you did for this report assumes a smooth parabolic channel  
24 for the Gila River?

14:33 25 A. That's the representative channel that falls out

1 in the computation, yes.

2 Q. You would agree with me, wouldn't you, that the  
3 entire flow of -- the entire stretch of the Gila River is  
4 not a smooth parabolic channel?

18:14:43 5 A. Sure. Absolutely.

6 Q. You agree with me it's not or you say it is?

7 A. It's not. But I would say that that smooth  
8 parabolic does represent the steady state conditions down  
9 the entire reach.

18:15:03 10 Q. But for purposes of somebody who is going to  
11 float a boat down the river, the difference between a  
12 smooth parabolic channel and a channel that maybe had  
13 sandbars and snags and different formations might make a  
14 difference, wouldn't it?

18:15:17 15 A. Definitely.

16 Q. And for purposes of this report, I think you said  
17 that you assumed that the natural Gila River was a single  
18 meandering channel. Is that right?

19 A. Yes. In the -- here is how this works. When you  
18:15:39 20 apply the hydraulic geometry method, that, in effect, is  
21 what you're assuming. And then when you go through it,  
22 then you check to see if that assumption is correct. And  
23 I used the four independent methods of showing that, and  
24 they all showed that "By golly, that's the kind of channel  
16:01 25 that that river wanted to be under its natural

1 conditions." That's what that means.

2 Q. But you would agree, wouldn't you, that at least  
3 at certain times, the Gila River -- and certain portions  
4 of the river there's at least some amount of braiding in  
18:16:13 5 the river, wouldn't you?

6 A. There could easily be braiding and that's a  
7 typical occurrence of nearly all alluvial channels,  
8 including the Mississippi.

9 Q. And the braiding would be -- could be at least an  
18:16:29 10 impediment to floating a boat?

11 A. It's possible that it would make navigability a  
12 little more difficult. Yes, it's possible.

13 Q. Because it spreads the flow out at different  
14 channels. Is that right? Or can?

18:16:40 15 A. It goes into different channels, i.e., the  
16 braiding. It is possible for it to be easier, because it  
17 might be rather than deep and narrow. So, you know, it  
18 depends. When you're thinking navigability, you've got --  
19 at least the way I think about it -- I separate it from  
18:17:01 20 navigation.

21 Navigability is just a susceptibility to it.  
22 So when you start getting specific, you know, like, is  
23 grading more difficult, well, you have to -- at that  
24 point, you start thinking of watercraft and all that, now  
17:12 25 you're, to me, into navigation.

1 Q. Okay. That's was the next question I wanted to  
2 ask you. Do you have a copy of your report with you?

3 A. I was looking to what happened to my notebook. I  
4 have a blue notebook someplace.

18:17:30 5 Q. Not the power, the actual report part of it.

6 A. Yes.

7 (An off-the-record discussion ensued.)

8 BY MR. MCGINNIS:

9 Q. Specifically I think what we were just talking  
18:18:08 10 about shows up on page 6 of your report. This is your --  
11 the one that's dated October 25th, 2002. Page 6, last  
12 bullet point. Is that the point that you were just  
13 making?

14 A. Yes. The mathematical assessment is that, yes.

18:18:34 15 Q. It says -- well, I guess the one I'm looking at  
16 says, "Navigability was independent of undesirable  
17 conditions ..." Are we talking about the same paragraph?

18 A. Yes.

19 Q. Okay. Could you explain to me once again how --  
18:18:44 20 what the difference you believe is between navigability  
21 and navigation or susceptibility to navigation?

22 A. Well, for example, the third navigability test I  
23 showed you, the USGS method, that's really independent of  
24 watercraft. It just shows how this river performs in  
19:06 25 regard to the force required to move a vessel, and it can

1 be any vessel. It's kind of a unit thrust presentation.  
2 So from that standpoint, it doesn't matter.

3 Q. You would agree with me, though, in the final  
4 analysis, when you come down to determining whether  
18:19:33 5 something is navigable or not, it really does come down to  
6 whether -- at least depends upon whether a subject to  
7 navigation can be navigated?

8 A. Well, I've shown you the watercraft that would  
9 navigate -- could navigate on it. I've showed you small  
18:19:44 10 watercraft most of the time and power boats, 70 -- 60, 70  
11 percent of the time, whatever. Depending on your skill at  
12 the high flow end.

13 Q. I'm not trying to be difficult. I'm just trying  
14 to figure out whether you have an opinion that I haven't  
18:19:55 15 figured out yet about -- something about navigability, it  
16 doesn't have to do with a boat.

17 A. Okay. Go ahead.

18 Q. Does navigability have to do with floating a  
19 boat?

18:20:07 20 A. A barge, some kind of floating vessel, yeah. The  
21 watercraft.

22 Q. On page 8 of your report, under section 1.1,  
23 looking specifically at the first paragraph under section  
24 1.1, third sentence, you say, "There are other factors of  
20:29 25 an economic and commercial nature that may be less

1 obvious." And I think that relates to navigability, but  
2 you can read the whole thing. My question is, what are  
3 the other factors of an economic and commercial nature  
4 that relate to navigability that may be less obvious?

18:20:45 5 A. Well, I didn't include those, but it has to do  
6 with running a business, of transporting beaver hides, or  
7 whatever, and the nature of that type of endeavor. And  
8 I'm not looking at that at all.

9 Q. Okay. So your testimony today is that there are  
18:21:09 10 factors in addition to those you've looked at that affect  
11 whether something is navigable or not?

12 A. No. No. I'm saying that it's susceptible to  
13 navigation.

14 Q. Just -- I'm not trying to quarrel with you, but  
18:21:26 15 that sentence -- the first sentence of that paragraph  
16 says, "The ability to navigate on a river encompasses many  
17 factors such as the amount of flow in the river channel,  
18 the width and depth of flow in the channel, the type of  
19 vessel and the purpose of the [vessel]."

18:21:39 20 A. Yes.

21 Q. Then the second sentence after that says there  
22 are other factors other than the minimum depth of water,  
23 which is the sentence I skipped.

24 A. Well -- and it's non-hydraulic factors that I  
21:50 25 didn't consider.

1 Q. Okay.

2 A. That gets into the economics and all kind of  
3 stuff.

4 Q. So there are factors in the navigability analysis  
18:21:56 5 that are non-hydraulic that you didn't consider in this  
6 report?

7 A. Yes.

8 Q. Okay. I'm skipping because that was -- in fact,  
9 it's late, I'm flipping through here.

18:22:24 10 COMMISSIONER ECHEVERRIA: Is it?

11 MR. MCGINNIS: You didn't notice? I think  
12 we've all become a little numb here at this point.

13 BY MR. MCGINNIS:

14 Q. It's true that your -- the flow data that you  
18:22:30 15 used, the flow information that you used for the Salt  
16 River reservation and the Gila River reservation, you took  
17 those two, which were from different rivers, and added  
18 them together to get a sum, right?

19 A. Yes.

18:22:43 20 Q. And you didn't consider evapotranspiration below  
21 those two points, did you?

22 A. Yes.

23 Q. How did you consider that?

24 A. Well, I described in the talk. I looked at the  
22:59 25 runoff from the inner reading area, which was rather

1 small, and -- but it appeared to approximately offset  
2 losses to ET along the river for the median and average  
3 flow, so I made the assumption that just keep it the same.

18:23:20 4 Q. So you assumed that the two of them cancelled  
5 each other out?

6 A. Right. On base flow, it was definitely a loss.

7 Q. You would agree with me, wouldn't you, Doctor,  
8 that there are certain portions of the year or portions of  
9 particular time of year where even you would agree that it  
18:23:38 10 would be difficult to navigate the Gila River under your  
11 ordinary and natural conditions?

12 A. Part of that would depend on skill and what the  
13 function of the navigation was, but generally speaking,  
14 yeah, during very high flows, that would be difficult for  
18:23:56 15 almost any skill -- any skilled person.

16 Q. It would also be true during very low flows,  
17 wouldn't it?

18 A. No. Not -- my analysis indicated that you could  
19 put a small boat on that just about all the time.

18:24:10 20 Q. On page 16 of your report, third paragraph  
21 down -- I'll let you look at it. Feel free to read the  
22 whole paragraph. I want to talk about the third sentence  
23 that says, "In terms of using a vessel on the Gila River,  
24 the lower flows such as the base runoff, may limit  
24:28 25 navigability for at least part of a typical year."



1 A. Yes, for -- depending on boat, it could do it.  
2 On the size of the boat and so forth.

3 Q. You talked some about the Bureau of Outdoor  
4 Recreation method of determining navigability in your  
18:24:50 5 presentation earlier?

6 A. Which page?

7 Q. In your report, page 24.

8 A. Okay.

9 Q. I think on page 24 and 25 you talk about that.

18:25:05 10 It's my understanding that you classify the Gila River as  
11 a Class I, very easy?

12 A. We're up to the mean -- yes, up to the mean  
13 discharge as shown on figure 4.1.

14 Q. And there can be obstacles like sandbars and  
18:25:21 15 riffles even in a Class I, isn't there?

16 A. Sure.

17 Q. You talk some about going in the upstream  
18 direction instead of -- in addition to the downstream  
19 direction in the presentation.

18:25:33 20 A. That was kind of just for fun. I'm just doing  
21 that for a point of interest. You don't need that for  
22 this assessment. But I thought I would share that.

23 Q. You've been here for the last -- what seems like  
24 a week, but it has only been two days of hearings, right?

25:49 25 A. Right.

1 Q. And you haven't heard anybody have any testimony  
2 in the last two days about anybody ever actually going  
3 upstream traveling, have you? On the Gila?

4 A. Well, no, I haven't heard one way or the other,  
5 really.

6 Q. Just making sure I hadn't missed anything in  
7 terms of what was going on.

8 A. They had some motorboats, you know, around the  
9 turn of the century, as far as I know. But you have to  
10 paddle a canoe up on the side. I've done some paddling on  
11 the Colorado River, and you have to hang in close to the  
12 banks to do it, all that kind of stuff.

13 Q. So I have couple of questions about the Langbein  
14 method of determining navigability, which is on page 27 in  
15 your report, just to make sure I understand the numbers,  
16 because sometimes I have a hard time with that. I think  
17 you say that the Gila River below the Salt River to the  
18 mouth has a coefficient or whatever you call it of .001?

19 A. Yes.

20 Q. And also on the same page, right before that  
21 table, you say, "Within the range from .002 to .001,  
22 navigation is usually limited to ferry or shortrun  
23 operations"?

24 A. Yes.

25 Q. And the Gila River is in that range, right?

1 A. Yes. And keep in mind, though, that this  
2 assessment in navigability in the USGS report, this is a  
3 pretty large craft, and in terms of downstream navigation,  
4 it shows that it would be a piece of cake.

18:27:34 5 Q. I'm going to show you a different document.

6 Have you seen this document before, Doctor?

7 A. I guess I wrote it, yeah.

8 Q. Could you please tell us what it is?

9 A. Let's see.

18:28:17 10 Well, these are what I call my notes when I  
11 was putting together my assessment.

12 Q. The notes that you did on your own in preparing  
13 this report, the report for this case?

14 A. Yeah. It's kind of like -- yeah, roughing it out  
18:28:34 15 and -- yes.

16 Q. On the second page -- first page says  
17 "Confidential Notes" at the top, right?

18 A. Yes.

19 Q. Those notes aren't confidential at this point,  
18:28:39 20 are they?

21 A. Not anymore.

22 Q. At some point they were, but not for a couple of  
23 years now, right?

24 A. Right. And that's just the way of identifying  
28:47 25 that, "Hey, this is personal stuff, and it's part of the

1 reporting procedure."

2 Q. Okay. On the second page of this document, is  
3 that your handwriting there on the lower right? Second  
4 page.

18:29:08 5 A. Number two?

6 Q. No, just the second page.

7 A. Yes.

8 Q. And the date is July 2001, is that about when you  
9 did this?

18:29:20 10 A. I guess so.

11 Q. That's before, I assume, the October 2002 report  
12 that was a done?

13 A. Yes. Well, yeah. Before it became final, yes.

14 Q. There's substantial differences between this  
18:29:32 15 draft -- this document and the report, wouldn't you say?

16 A. Yes. Definitely.

17 Q. For example, in the very first sentence of this  
18 document you say, "My limited research on the history of  
19 navigability of the Gila River suggests it was not used on  
18:29:46 20 a regular basis for any kind of water transportation of  
21 bulk commodities such as furs or covered wagons or  
22 people."

23 A. Yeah, but I'm not a historian.

24 Q. And this sentence didn't end up in your report,  
29:57 25 did it?

1 A. No, it certainly didn't because I'm not qualified  
2 to really do that. This is just rough reporting for me to  
3 document what I observed at the time. Simple as that.

4 Q. Okay. I understand.

18:30:14

5 A. I do remember learning about Buckey O'Neill when  
6 I was in grammar school, and I thought it would have been  
7 fun to have gone down there with Buckey.

8 Q. There's a very nice statue of him in Courthouse  
9 Square in Prescott.

18:30:24

10 A. I know.

11 CHAIRMAN EISENHOWER: It's really not.

12 MR. MCGINNIS: It's not him?

13 CHAIRMAN EISENHOWER: The statue is the

14 Arizona Rangers that went on the first cavalry to the

18:30:34

15 Spanish-American war. And everybody proclaimed it to be  
16 Buckey, but it really wasn't. It was just symbolic of the  
17 Rangers.

18 MR. MCGINNIS: I'm glad I stayed tonight  
19 because I've learned something new.

18:30:55

20 CHAIRMAN EISENHOWER: A little levity at  
21 this hour of the night.

22 BY MR. MCGINNIS:

23 Q. I want to look at what I think is page 35 of this  
24 document.

31:10

25 A. They are handwritten down at the bottom?

1 Q. Yeah.

2 A. Okay.

3 Q. Okay. Under Topography.

4 A. Yes.

18:31:17 5 Q. Can you explain to me what -- you can take your  
6 time to read it -- explain to me what this is talking  
7 about?

8 A. I took USGS maps and from them -- this is seven  
9 and a half minute topo -- from them, I just cut  
18:31:38 10 cross-sections on them and did some very crude  
11 computations of width, depth, and velocity. Considering  
12 the scale of the maps and so forth, it's, you know, like  
13 hydrologists -- I can -- if you show me 160 acres of  
14 alfalfa, I can just real quickly tell you how much water  
18:32:00 15 it would use in a year, whether it's here or in the Verde  
16 Valley or up in Utah or whatever. So this is kind of that  
17 type of thing. Kind of zeroing in on what's there.

18 Q. The third sentence of that topography paragraph  
19 says, "Two of the sites were selected because there were  
18:32:18 20 braided channels that represented a worst-case condition  
21 for navigability."

22 A. That's right. Downstream of Gillespie Dam about  
23 5 miles there is a reach there that was shown braided on  
24 the topographic map, but keep in mind, the map was  
32:32 25 produced after all these diversions and everything and

1 after the big floods.

2 Q. The very next sentence, though, you wrote -- as  
3 of July 2001 you wrote, "It is unknown if the braided  
4 conditions were representative of natural conditions."

18:32:43 5 A. That's right. I didn't know at that time.  
6 That's right.

7 Q. And just to save some time, the next couple of  
8 paragraphs also talk braiding, don't they? If you want to  
9 go through them, we can. I'm not trying to trick you or  
18:33:00 10 anything.

11 A. Let's see, that's on 36?

12 Q. Look at the bottom of 35, next to the last  
13 paragraph, second sentence says, "Following very large  
14 floods the channel may have become destabilized and  
18:33:08 15 reaches may have developed multiple channels of braids."

16 A. That can happen after large floods, yes. And  
17 then it heals and tries to go back to what it wants to be.

18 Q. Next paragraph, first sentence says, "There may  
19 have been channel braiding in places along the Gila River  
18:33:22 20 as suggested by the oldest available USGS topographic  
21 maps."

22 A. That's true.

23 Q. Next sentence, "There was also at least one  
24 historic account of multiple channels." Is that right?

33:38 25 Next sentence after the one I just read.

1 A. Yes.

2 Q. At the time this document was produced, or at  
3 least completed in the form it is, had anybody reviewed it  
4 other than you?

18:33:49 5 A. No.

6 Q. I'm assuming your report has been reviewed --  
7 your final report has been reviewed by people other than  
8 you. Is that right? I'm not asking names. I'm just  
9 wondering if anybody else has read it before it is  
18:34:14 10 finalized.

11 A. Yeah, there's somebody that read it, but it  
12 didn't go through a real rigorous review that I can  
13 recall. Yes, it was read by a couple of people.

14 Q. And I think that you said in your presentation  
18:34:37 15 earlier that you used Manning's equation as part of this  
16 analysis?

17 A. Yes. The hydraulic geometry method is quite  
18 precise for the estimation of width, but it's not as good  
19 for depth and velocity. And I felt that by taking the  
18:35:05 20 width and then the known parabolic shape of the channel  
21 that's tied to the methodology, I decided to use Burkham's  
22 method, which I felt was more accurate. It would have  
23 been a lot easier to do it the other way.

24 Q. Manning's equation has several assumptions and  
35:21 25 simplifications, I think you say in this document, right?



1                   Again, I'm not trying to trick you.

2 Page 44, very top. You talk about the assumptions and  
3 simplifications of Manning's equation.

4           A.    Page 40?

18:35:48 5           Q.    44.

6           A.    44. These are standard assumptions. And I'm  
7 looking at it with a rather refined point of view. I have  
8 published books on how to estimate Manning and so forth.  
9 And so I'm, yeah, I am making notes that remind myself of  
18:36:17 10 the limitations.

11           Q.    And there are limitations in not only Manning's  
12 equation but also in the general methodology you used,  
13 aren't there?

14           A.    Sure.

18:36:35 15           Q.    On page 45 of this document, you said -- it would  
16 be under the heading there -- "Obviously, a large number  
17 of historic measurements of channel characteristics,  
18 especially channel width and depth for dry-weather flows,  
19 would be important information for assessment of  
18:36:47 20 navigability." Do you see that?

21           A.    Yes.

22           Q.    And you didn't have that -- those historic  
23 measurements, did you?

24           A.    I didn't have anything that, you know, that was  
37:02 25 furnished to me or whatever. And I did make the decision

1 basically not to use it. Now, I did incorporate some  
2 historic observations that are produced in the final --  
3 that are shown in the final report. But that's really not  
4 very critical information in regard to what I did.

18:37:29

5 (An off-the-record discussion ensued.)

6 BY MR. MCGINNIS:

7 Q. The last couple of questions I have on this  
8 document, page 66, the Results.

9 A. Okay.

18:38:05

10 Q. You agree with me, Doctor, wouldn't you, that the  
11 substantial portion of the information on this results  
12 page doesn't appear in the final report, does it? You're  
13 welcome to compare pair, if you want.

14 A. Yeah, definitely some of it doesn't appear in  
15 there, yes.

18:38:24

16 Q. For example, the second paragraph talks about  
17 "Navigability of the Gila River below Gillespie Damsite  
18 was limited by areas with multiple (braided) channels  
19 because flow was divided among two or more channels."

18:38:39

20 A. Right.

21 Q. And I don't think that's in report, is it?

22 A. No. And all that happens there is -- I don't  
23 mean you can't apply it, but it means that to use that  
24 type of channel shape would be much less precise if it  
25 was, say, a braided condition; then you have to look at it

38:55

1 from a braided standpoint.

2 Q. The next sentence says, "Computations showed the  
3 flow depths of the split flow was less than 1 foot in all  
4 of the split channels about one month in a typical year."

18:39:11 5 A. It did appear that way in that one spot. But  
6 like I say, that was -- that was in 19- -- Well, it was  
7 well after the 1891 flood and the 1905 flood, I believe.

8 Q. And as far as you know, that sentence doesn't  
9 appear in your report, does it?

18:39:29 10 A. No, because it's a clearly natural condition, so.

11 Q. The next sentence says, "Low flow navigation  
12 would be unlikely in these areas of split flow about one  
13 month or perhaps 5 or 6 weeks of a typical year."

14 A. Yes. Given the water -- given the unnatural  
18:39:45 15 channel, yes.

16 Q. That doesn't appear in your report either?

17 A. No. Because that's the unnatural channel.

18 Q. So was this report -- or this document prepared  
19 to deal with the unnatural channel? This document we're  
18:40:04 20 talking about that says "Confidential Notes," which you're  
21 calling the unnatural channel?

22 A. No. I'm staying with the natural, but I was  
23 using the oldest available information, putting it in one  
24 document, and then taking -- sitting back and taking an  
40:12 25 assessment of it and realizing, "Hey, this isn't -- we've

1 had major floods and so forth, and what I'm looking at  
2 here isn't even close to natural."

3 Q. Next sentence says, "Navigability during high  
4 flows, as with all natural rivers, was also limited,"  
18:40:38 5 right? Is that right?

6 A. Yeah. That's true with every river.

7 Q. And that's not in your final report either, is  
8 it?

9 A. I have shown a range, I believe, there. But that  
18:40:42 10 almost goes without saying, doesn't it? You're going to  
11 get a major flood on the Mississippi or the Gila.

12 Q. I don't know if this says major flood. It says  
13 "navigability during high flows." I don't mean to quibble  
14 with you, but you know what you meant.

18:41:08 15 A. It's big time flow, yeah.

16 Q. Next sentence says, "The analysis, using the rule  
17 of thumb technique, suggests navigability would be  
18 difficult during about 2 weeks of high flow." Is that  
19 right?

18:41:08 20 A. That was, yes, that's kind of what it looked  
21 like, then I realized that that's -- was a lot of judgment  
22 in that related to skill of the person in the craft and  
23 the type of craft and that kind of stuff, so I took it  
24 out. That's more of a navigation thing as opposed to  
41:25 25 navigability.

1 Q. Next paragraph -- and I'm trying to begin --  
2 short-circuit this so we can finish some time before  
3 sunup -- next paragraph basically says that the channel  
4 changes resulting from flooding also affects navigability?

18:41:40

5 A. Yes.

6 Q. That's right.

7 A. Yes.

8 Q. So your conclusion, the bottom of the result  
9 section of this document, is as with most periods --

18:41:46

10 excuse me, "As with most rivers, navigability would have  
11 been restricted during both high and very low flow  
12 periods." Is that right?

13 A. Yeah, it would be more difficult, yes.

14 Q. And I'm assuming because you say "would have  
15 been," you're not talking about July of 2001, you're  
16 talking about some previous time. Is that right?

18:42:05

17 A. Yes.

18 Q. You testified -- or at least were retained by  
19 Mr. Helm's firm or his client in the Gillespie Dam case.

18:42:51

20 Is that right?

21 A. Yes.

22 Q. And you were deposed in that case in January of  
23 2003. Is that right?

24 A. Okay.

43:06

25 Q. Well, you have the document in front of you?

1 A. Yes.

2 Q. It says "January 16, 2003"?

3 A. Okay.

4 Q. And this, as far as you know -- you have seen a  
18:43:10 5 copy of this transcript before. Is that right?

6 A. Yes.

7 Q. You don't have any reason to think anything in  
8 here is not what you actually said, do you?

9 A. I'm not aware of it.

18:43:20 10 Q. Okay. Rather than reading back questions and  
11 answers to you and spending our time, I think I'm going to  
12 just submit this as a document as an exhibit to the  
13 commission.

14 MR. MCGINNIS: And that will conclude my  
18:43:46 15 questioning.

16 COMMISSIONER ECHEVERRIA: Does anyone else  
17 have any questions?

18 John?

19 (Mr. Hjalmarson is answering questions.)

18:43:48 20 BY MR. HESTAND:

21 Q. May it please the commission, I am exceedingly  
22 aware of the fact that every question I ask keeps me from  
23 getting home to my wife and child. And in light of  
24 self-interest says I will attempt to move things along.

44:04 25 Just as a preliminary thing, sir, am I

1 correct that you have presented no evidence on and  
2 rendered no opinion about the navigability of the Gila  
3 River upstream from the confluence of the Salt River?

4 A. That's true.

18:44:22

5 Q. Does your report list all sources of data or  
6 information that you used in preparing that report, your  
7 testimony -- your testimony today and the conclusions that  
8 you drew?

9 A. To the best of my knowledge.

18:44:39

10 Q. Okay. Does your report list all specific data  
11 that you used in the computations of the various formula  
12 and making all of the conclusion that you drew either in  
13 the report or the testimony that you have given today?

14 A. Yes. The references I used have the formulas and  
15 so forth that may not be in the report, but you have to go  
16 to reference to see how it was done.

18:45:11

17 Q. Okay. Perhaps I was unclear because the question  
18 I was asking is, does your report contain all of the data  
19 that was used? I'm not interested in the formulas. I'm  
20 interested in data that was plugged into the formulas from  
21 which you drew your conclusions. Does your report include  
22 all data that you used in making those computations and  
23 drawing your conclusions?

18:45:20

24 A. There's some sediment analyses that's not in the  
25 report that I used, but I ended up using five different

45:53

1 sediment characteristics which encompassed a broad range,  
2 and that sediment is covered in the NRCS -- the soil  
3 survey reports, so that would match that.

4 Q. Okay.

18:46:16 5 A. But the actual field samples and analyses, no,  
6 all of that is not included in that report, no.

7 Q. Okay. The reason I'm going through this is that  
8 under scientific analysis for any scientific conclusion of  
9 any validity has to be capable of repetition, correct?

18:46:42 10 A. Yes.

11 Q. If the data that you used is not contained in  
12 your report, then that makes it impossible for any other  
13 independent engineer to verify the correctness or  
14 incorrectness of your conclusions. Is that correct?

18:46:55 15 A. That's correct. However, like I just said, the  
16 sediment information would be in the NRCS reports. And  
17 using similar approach that I used, you might logically  
18 come up with the use of an average of, say, channel width  
19 based on the wide range of sediment that's out there. So  
18:47:19 20 in that sense, the information -- the information is there  
21 for anybody to check it.

22 Q. Okay. And is it my understanding, then, that  
23 based upon your report, a person would be able to go to  
24 the source data that you used, figure out the way you used  
47:42 25 that data, and then -- and which data you used, and then



1 apply it to the computations?

2 A. Yes.

3 Q. Okay. And if somebody -- if that information is  
4 not available, and it cannot be done, then am I correct  
18:47:55 5 that that casts severe doubt on the correctness of your  
6 computations if they cannot be duplicated?

7 A. Well, as I can simply -- if they had trouble with  
8 that, they can give me a call and I can provide them with  
9 information or whatever they might --

18:48:14 10 Q. Sir, your testimony is today. Your testimony is  
11 not going to be on the phone with somebody else two weeks  
12 from now.

13 My question is, based on the report that you  
14 have provided to the commission, and the testimony you  
18:48:27 15 provided today, is it all the information necessary for  
16 someone to verify your results clearly and readily  
17 available for that individual to use?

18 MR. HELM: Pardon me, Mr. Chairman, but if I  
19 was in court I'd say, "Argumentative." I don't see -- you  
18:48:51 20 had the privilege of yelling at me for yelling at people,  
21 and I would like you to stop yelling at my witness. Fair  
22 enough?

23 MR. HESTAND: Very good. I'll lower my  
24 tone.

48:58 25 BY MR. HESTAND:

1 Q. The question still stands.

2 A. The answer basically still stands, yes, you can  
3 duplicate it. Now, keep in mind -- I want to put a caveat  
4 on it -- there's -- when you go into the hydrology and  
18:49:10 5 take a look at that, you're going to have -- there's a lot  
6 of references to USGS data in there. Okay. So you will  
7 have to -- you might have to go into that if you want to  
8 check their methodology.

9 Q. Okay. Then the MRCS reports list ranges of data,  
18:49:35 10 not specifically values?

11 A. That's right.

12 Q. Did you use the high, low, or some other value in  
13 making your computation?

14 A. As I showed in computation, I took five different  
18:49:40 15 particle size medians from the gravel all the way to the  
16 silt clay. I computed the width using that, that full  
17 range, because my field inspection, of which I showed the  
18 photos in the report, showed a wide range. And part of  
19 that's due to maybe coarse material coming in from  
18:50:10 20 tributaries or whatever, but it was a hodgepodge -- it's a  
21 hodgepodge out there and of course the lower end, it's a  
22 man-made channel. And based on what I saw, I just  
23 computed it five different ways covering this wide range  
24 that's NRCS or what my photos show and take the average  
50:24 25 and make it -- let's make it easy. I didn't -- you're

1 faced with a decision of not to overcompute what's going  
2 on here, and it's safer to work with averages because  
3 we're taking a general look at this thing. The long-term  
4 studies state environment, that's what's going on.

18:50:44

5 Q. Am I correct that with any computation the  
6 acronym GIGO is applicable?

7 A. The what?

8 Q. The acronym GIGO -- garbage in, garbage out?

9 A. Oh, okay.

18:50:59

10 Q. Does your report -- and I'll try to keep my  
11 volume down -- does your report list all of the  
12 calculations that you made with regard to your  
13 computations and conclusions, does it show every  
14 calculation you went through?

18:51:16

15 A. No.

16 Q. Okay. Does it show the steps that you went  
17 through?

18 A. Just a summary.

19 Q. Just a summary?

18:51:27

20 A. But it gives the report that I used.

21 Q. Okay. So that if someone else were to take the  
22 data and the results -- the data and the process and come  
23 up with a different result, there's no way to check back  
24 against your work. Is that correct?

51:49

25 A. No. No. You can check it.

1 Q. Do boats float on average?

2 A. Do boats float on average?

3 Q. Uh-huh.

4 A. Whose average?

18:52:11 5 Q. That's my question. If you have a stream that is  
6 1 inch and a stream that is flowing at a hundred yards,  
7 would your boat float on 50 yards? Does it float on the  
8 average?

9 A. 50 yards of depth, width, or -- what are you  
18:52:28 10 talking about?

11 Q. Does the average tell you any information at all  
12 about whether or not on any particular day the boat will  
13 float?

14 A. In the assessment of navigability, the average  
18:52:48 15 channel shape and morphology and velocity and so forth  
16 tells you a lot about the navigability, yes.

17 Q. Does Mother Nature know that she is supposed to  
18 be a certain average on a certain date?

19 A. According to the computations, Mother Nature,  
18:53:09 20 i.e., whatever is making the river -- the Gila River what  
21 it is, it wants to be a channel like I described.

22 Q. Uh-huh.

23 A. It wants to be kind of a mildly sinuous  
24 meandering channel, that's what everything shows. And on  
53:25 25 the average, that's kind of the shape you're going to get,

1 on the outside in beds, one side of the channel would be  
2 deeper, and when it meanders the other way, then the  
3 outside of that bed will be deeper, et cetera, et cetera,  
4 so there's variation in there.

18:53:48

5 Q. Does your report list all calibration efforts you  
6 made with regard to your computations and your  
7 conclusions?

18:54:13

8 A. I don't think I really calibrated as such. I did  
9 some comparison, but I didn't do any recomputation as  
10 such, no.

18:54:24

11 Q. Now, one specific example, you used the sketch of  
12 a river channel as the parabolic curve and you have a  
13 formula, a power function formula to determine about  
14 self-forming rivers, and your formula is  $W$  equals small  $A$   
15 large  $Q$  to the power of small  $B$ ?

16 A. Uh-huh.

17 Q. Now, am I correct that in that formula, that  
18 formula is it worthless if  $A$  and  $B$  are not calibrated?

18:54:42

19 A. You have to go into the Osterkamp publication to  
20 get it.

21 Q. And am I correct that you did not calibrate?

22 A. No. You plug in the values and out come the  
23 coefficient and exponent.

54:49

24 Q. So you're saying that you didn't need to  
25 calibrate?

1 A. Uh-huh.

2 Q. And is -- you're testifying under oath?

3 CHAIRMAN EISENHOWER: No.

4 MR. HESTAND: Oh, darn it.

18:54:57 5 (An off-the-record discussion ensued.)

6 BY MR. HESTAND:

7 Q. However, as a registered engineer, it is your  
8 testimony that in the formula  $W$  equals  $A$  -- small  $A$ ,  
9 capital  $Q$ ,  $B$ , that based upon your professional  
10 qualifications,  $A$  and  $B$  do not need to be calibrated?

18:55:19

11 A. Well, there's a fitting process in the  
12 computation, if that's what you are getting at. And there  
13 are multiple computations involved in it. And I guess in  
14 the -- in a very loose sense, you can call that a  
15 calibration, but it's not. As you compute several  
16 situations and then you look for the crossing of the  
17 variables, and that's the point of the final computation.  
18 I believe that's what I did. It's been quite a while.

18:55:38

19 Q. Just a moment, I'll follow up.

18:55:59

20 A. Let me ask -- I need to clarify something before  
21 we go further. Can I ask him a question?

22 Q. Me?

23 A. Yeah.

24 CHAIRMAN EISENHOWER: It's unusual.

56:10

25 MR. HESTAND: I don't care. Depends on how

1 the commission feels about it.

2 CHAIRMAN EISENHOWER: If you want to make a  
3 clarifying statement?

4 MR. HJALMARSON: Yes. I want you to clarify  
18:56:16 5 what you mean by "calibration."

6 BY MR. HESTAND:

7 Q. Calibration is taking independent data and  
8 using -- plugging it into the formula to confirm whether  
9 or not you were coming to the proper results in a formula,  
18:56:38 10 computer model, something of that nature?

11 A. I don't recall doing it in that fashion, no.

12 Q. Okay. Did Osterkamp do calibration for the Gila  
13 River in his general treatise?

14 A. No. I discussed the application of this method  
18:56:51 15 for the lower Gila with Osterkamp and discussed -- I know  
16 Waite quite well, and I discussed what I intended to do,  
17 and he said, "Hey, I've got just the set of formulas for  
18 you." And he mailed me that publication because there are  
19 several different formulas out there that you can use.

18:57:14 20 However, you get in a lot of trouble with some of them  
21 because a lot of them are, say, for bid models. This is a  
22 base level stream with perennial flow. And Waite has done  
23 a lot of work on those, and he sent me his publication and  
24 thought it was good idea.

57:37 25 Q. Okay. Now, I apologize if you've answered this

1 one, but to be honest, I don't think you have ever  
2 directly answered yes or no. Does the formula -- and this  
3 is based upon your qualifications as a professional  
4 engineer -- does the formula  $W$  equals small  $A$ ,  $Q$  to the  
18:57:56 5 power of small  $B$  require calibration?

6 A. Not in the sense I use calibration as I explained  
7 to you, no.

8 Q. I'm not asking in the sense you used it, I'm  
9 asking in the sense that professional engineers will use  
18:58:15 10 it. Would other professional engineers expect it to be  
11 calibrated?

12 A. Again, I'm having trouble with what you mean by  
13 "calibrated." Do you mean do you go out and make a  
14 measurement with the current meter to test it or what?  
18:58:37 15 What are you talking about?

16 Q. You take sources of data, you run them through,  
17 you use --

18 A. What sources of data?

19 Q. Sir, you're the engineer.

18:58:46 20 A. Sir, you're the one that's giving me some kind of  
21 hypothetical example. What data? Give me some data.

22 Q. Tell you what, I think the point has been made so  
23 we're going to move on.

24 CHAIRMAN EISENHOWER: I do too.

58:57 25 BY MR. HESTAND:



1 Q. Now, the report that you in part relied upon,  
2 "Predevelopment of the Gila River Indian Reservation," was  
3 Burt Thomsen one the two authors of that report?

4 A. Yes.

18:59:17 5 Q. Okay. And am I correct that his determination of  
6 predevelopment vegetation was based on aerial photographs  
7 from the 1930s?

8 A. I can't answer that. I had -- Burt was -- I  
9 employed Burt for a very short time when I initially  
18:59:44 10 started this and basically discussed what I was doing and  
11 so forth. And I don't recall specifically how he did  
12 that. You will have to -- I would recommend that you --  
13 he was the author of both of the reports, and then he had  
14 junior authors Jim Eychaner and Porcello with him on each  
19:00:07 15 one. I would suggest that you go to those reports.

16 Q. Okay. So if the reports indicate that his  
17 conclusions are based on aerial photography in the 1930s  
18 then that's what it was. Is that correct?

19 A. Whatever he used. I think very highly of his  
19:00:26 20 skills and I was -- after discussing it with it I was  
21 ready to go and -- but like I showed you, I did three  
22 independent checks on it just to satisfy myself.

23 Q. Okay. Are you aware of the fact that during the  
24 1890s and the early 1900s that approximately 100,000 acres  
00:55 25 of mesquite died because of a loss of groundwater and that

1 during the starving years, the Pima Indians were required  
2 to harvest that mesquite as firewood in order to feed  
3 their families? Are you aware of that fact?

4 A. I'm aware that the mesquite died there and other  
19:01:13 5 places.

6 Well, I don't know whether I should answer  
7 that with a personal account or not. But during World  
8 War II, when my father was in -- overseas in Iceland for  
9 seven years, we went to our cabin up in Mingus Mountain  
19:01:40 10 with my mother and my brothers, and she hired a fellow,  
11 his name was Ambrose Jackson, who was an Indian from the  
12 Gila reservation, and he came up there to cut wood and  
13 stuff for us. And the reason he came up there is that the  
14 wood cutting operation down there was poot, so he was  
19:01:53 15 anxious to get out of the heat and come on up.

16 Q. So am I correct, then, that an aerial photograph  
17 from the 1930s would not show 100,000 acres of  
18 phreatophytes that were cut down in the 1890s?

19 A. Well, again, you better go back to Burt Thomsen.  
19:02:13 20 But let's just review this real quickly. I told you that  
21 215,000 acre-foot per year was set aside in the  
22 groundwater modeling that Eychaner and Thomsen did for  
23 losses to along the mesquite and so forth. You do your  
24 computations, you guys, and see how big an area that is.

02:41 25 Q. Well, mesquite will be considered smaller than

1 100,000 acres based on the fact that mesquite is  
2 phreatophytes that drinks all the water it can use?

3 A. He describes his computation.

4 Q. Am I correct that Mr. Thomsen's report -- Strike  
19:02:51 5 that.

6 If the commission will be patient with me  
7 for just a second if I ask it properly -- ignoring leap  
8 years --

9 A. What?

19:03:21 10 Q. In ignoring a leap year -- a normal 365-day  
11 year -- in a normal 365-day year, is the median annual  
12 flow divided by 365 the same as the median daily flow?

13 A. Median?

14 Q. Uh-huh.

19:03:45 15 A. No. It's not computed that way.

16 Q. Okay. And am I correct that Mr. Thomsen in his  
17 report showed only the median annual flow, not the median  
18 daily flow?

19 A. He showed the median flow which -- and there is  
19:03:59 20 an implication that that's the distribution of daily flow  
21 for the year, and -- or instantaneously you get the same  
22 thing on percent greater than. It doesn't matter.

23 Q. No, sir. Are you telling me that there is no  
24 difference between median daily flow and median annual  
04:17 25 flow?

1 A. Not when you're looking at a long-term relation,  
2 for the purposes of what I was doing, it's essentially the  
3 same. You get -- any difference would be insignificant.

4 Q. Okay, thank you.

19:04:43 5 Now, you were asked about the assumption  
6 that the Pima and Maricopa Indians had never irrigated.  
7 If the historic record established that they irrigated in  
8 excess of 35,000 acres, would that have an impact on your  
9 analysis?

19:05:02 10 A. Again, if that's what they were doing, then we  
11 would have to evaluate how much vegetation was there. So  
12 I would have to have all the variables in order to make  
13 that assessment.

14 Q. Okay. And back to my question, sir. Would it  
19:05:24 15 make a difference in your results?

16 A. It could make a difference.

17 Q. Thank you.

18 A. Small difference.

19 Q. Now, here I'm really not trying to trap you. I'm  
19:05:45 20 trying to get something clear.

21 A. I'm with you. I'm trying to help you here.

22 Q. Am I correct that you're testifying that the Gila  
23 River below the confluence with the Salt was susceptible  
24 to navigation every day even at times of low and high flow  
05:59 25 based on the skills of the navigator? Is that what you're

1 saying?

2 A. There's a large part of the year where it was  
3 susceptible to navigation. Now, it's a real low end. If  
4 you notice the relations I produced, I leave the low end  
19:06:15 5 out and the high end. I'm leaving a little room there.  
6 But nearly all of the time you can put a small watercraft  
7 on there, of course the high flows, then your skill comes  
8 in. And I personally wouldn't want to be on there in a  
9 major flood in anything, or any alluvial river in a major  
19:06:43 10 flood.

11 Q. Sir, what I'm understanding is that your  
12 theoretical computations --

13 A. Empirical.

14 Q. Empirical. Empirical computations say that the  
19:06:57 15 Gila River below the confluence of the Salt was  
16 susceptible to navigation most of the days on the year.  
17 Is that correct?

18 A. Uh-huh.

19 Q. Why didn't anybody ever use a boat?

19:07:09 20 A. That wasn't my job to assess that. I've been  
21 listening to testimony all day and so -- ask a historian.

22 Q. Is it possible that empirical -- if an empirical  
23 computation is disputed by actual facts, does that  
24 indicate that there might be a problem with the empirical  
07:30 25 computation?

1 A. Yes, if it's done properly. Now, let's give it  
2 an example here. A lot of the accounts of, quote, putting  
3 boats on the river occurred after the diversions and  
4 storage occurred. And I have been trying to be real clear  
19:07:47 5 that this is roughly prior to 1860. Okay. So diversions  
6 were rampant over the whole watershed. Sometime during  
7 the '60s it was going on everywhere. Okay.

8 Now we hear a lot about the Phoenix area and  
9 Swilling's Ditch and all that, but believe me, it was  
19:08:10 10 going on up in the Safford Valley, Portales, New Mexico,  
11 down in Mexico, up in the Verde, all over.

12 Q. Okay. Sir --

13 A. And that was affecting navigability.

14 Q. Okay. Prior to the first Euro-American arrival,  
19:08:32 15 you've been listening to the testimony and you have heard  
16 that there is not a single recorded instance of a Pima  
17 Indian or a Hohokam Indian ever using a boat on the river.  
18 If it were susceptible of navigation majority of the days  
19 of the year, what is your explanation for the fact that no  
19:08:53 20 Pima Indian prior to the arrival of the first white man  
21 ever used a boat?

22 A. That is totally out of my area of expertise.

23 Q. Okay. So there is a possibility that facts and  
24 empirical computations may be at loggerheads?

19:09:12 25 A. That's not for me to decide at this point.

1 Q. Thank you.

2 I really am hurrying, folks.

3 You talk about the survey of channels, about  
4 the width of the channels, when were those surveys  
19:09:23 5 conducted?

6 A. I talked about the survey?

7 Q. Yeah, there were surveys and you used those to  
8 determine how wide the channels were?

9 A. Those are the GLO surveys that we've been talking  
19:09:40 10 about all day.

11 Q. What are the dates?

12 A. There's a pile of them right here.

13 Q. What were the dates?

14 A. What was the date I say? 1867 to 1892, I believe  
19:09:44 15 it was, the ones that I --

16 Q. So they were before the 1905 flood. Is that  
17 correct?

18 A. Yes.

19 Q. And would the 1905 flood have changed the river?

19:10:02 20 A. Always. In 1891 it changed.

21 Q. So in actuality, relying on data on the width of  
22 the river in 1880 provides you no real use when there has  
23 been a '91 -- a flood in '91 and 1905. Is that correct?

24 A. Sir, you've apparently missed the point of what  
:10:23 25 I'm saying here. What I did was reconstructed what the

1 natural flow was, which occurred roughly 1860 to maybe  
2 1760, and that's a period that was checked to where the  
3 climate and so forth seemed to be pretty constant, and so  
4 what I created was -- let's say I reconstructed the  
5 natural flow.

6 (An off-the-record discussion ensued.)

7 BY MR. HESTAND:

8 Q. Winding up.

9 Did you compute your water flow based on  
10 1912?

11 A. I used the natural water flow.

12 Q. The natural flow based on 1912?

13 A. No. I applied it to the statehood and in  
14 conformance with the standard.

15 Q. Did you base it on 1912 channel conditions?

16 A. No.

17 MR. HESTAND: Okay. Thank you.

18 And I thank the commission for their  
19 patience.

20 MR. HELM: I have four rebuttal questions.

21 (A recess ensued.)

22 CHAIRMAN EISENHOWER: Anybody have questions  
23 for Mr. Hjalmarson.

24 MS. COPELAND: I do.

25 (Mr. Hjalmarson is answering questions.)



1 BY MS. COPELAND:

2 Q. Kirsten Copeland on behalf of Buckeye Irrigation  
3 Company, Buckeye Water Conservation Drainage District. I  
4 just have a few. Believe me, I want to get home too.

19:33:26 5 Win, as I understand it -- and please bear  
6 with me because this is first time I've seen your  
7 slideshow and there were a lot of slides and they went by  
8 pretty fast, so I'm going to try and take a very broad  
9 approach, and if I really screw it up, please tell me.

19:33:36 10 But otherwise we'll be here all night and I don't want to  
11 do that.

12 So as I understand it, the point of your  
13 study was to evaluate the nature of the morphology. In  
14 other words, what the Gila channel would have looked like  
19:33:52 15 predevelopment. Is that right?

16 A. That would be the hydrology and the hydraulics  
17 and geomorphology --

18 Q. Okay --

19 A. -- reconstructing the natural conditions for  
19:34:05 20 those -- for that.

21 Q. So that would be both the shape, meaning of the  
22 channel, as well as what was flowing through it and how  
23 much?

24 A. Yes.

34:15 25 Q. And in your report, you've at least loosely

1 defined predevelopment as being a pre-Anglo diversion. Is  
2 that correct?

3 A. Yes. I used the date of 1860 or so and the  
4 hundred-year period.

19:34:31 5 Q. So to create your model -- well, I should say the  
6 model of the channel including the flow of the channel, as  
7 I understand it, you did two things. You took estimates  
8 of predevelopment mean channel flow -- I might have to  
9 break it up -- so one of the things you took were  
19:34:52 10 estimates generated by the USGS of predevelopment mean  
11 channel flow. Is that correct?

12 A. Mean, median, and base.

13 Q. Okay. And you also, then, used a technique which  
14 is based on sediment size distribution to model the  
19:35:13 15 morphology, the shape, if you will, and the width -- the  
16 width and depth and shape of the channel?

17 A. Yes. They're empirical relations that have  
18 derived from studies of alluvial channels. And then you  
19 customize them by inserting the sediment characteristics  
19:35:31 20 of your particular alluvial channel.

21 Q. And on the sediment size distribution, as I  
22 understand it, you utilized sediment that you had  
23 collected yourself out of the Gila basin.

24 A. I used -- I collected sediment samples. I took  
35:49 25 visual observations. I have been around sediment for a

1 long time so I can make a pretty good visual observation.  
2 And I relied heavily on the NRCS soil surveys and the  
3 rather general information that's in there. And I matched  
4 what I saw and that was it.

19:36:12 5 Q. So the NRCS soil surveys provided you profiles,  
6 if you will, against which to evaluate the samples that  
7 you took. Is that correct?

8 A. Yeah. Well, my samples agreed with what they  
9 published, yes.

19:36:27 10 Q. I'm sorry, were you finished?

11 A. And like I say, I came up with a wide range. So  
12 I computed -- used the wide range and then used the  
13 median. So if I wanted to get cagey, -- I'm just adding  
14 this -- if I wanted to get cagey, I could have picked the  
19:36:42 15 one that might benefit whatever outcome I wanted, but I  
16 didn't. I just took the average and let's go.

17 Q. But the data set that you actually used to create  
18 your channel profile was based on the soil samples -- or,  
19 I should say, sediment samples that you yourself took down  
19:36:59 20 in the Gila River basin?

21 A. I took my own and -- yes, made visual  
22 observations and used NRCS.

23 Q. So how do the sediment that you collected rate --  
24 relate to either pre-1912 profiles or any predevelopment  
37:18 25 profiles?

1 A. Well, what's in channel now is pretty good  
2 indicator of what has been there. It's just been  
3 remobilized and redistributed. And that, by the way, is  
4 another reason why I used this average approach. So keep  
19:37:35 5 in mind, I'm reconstructing what was there about 1860  
6 so --

7 Q. Nevertheless, the sediment that you collected,  
8 you did not attempt to make any determination as far as  
9 the time frame in which those sediments were laid down?

19:37:51 10 A. No. I don't think that would be worthwhile.

11 Q. And however those sediments were laid down, they  
12 were not laid down under predevelopment conditions. Is  
13 that correct?

14 A. Sure. They've been there for years.

19:38:07 15 Q. And as I understand it also, in order adequately  
16 to -- well, maybe not even adequately -- but in order to  
17 make any sort of a profile, if you will, of the channel,  
18 you have to make certain assumptions as to what the  
19 overall nature of that channel looks like. Is that  
19:38:23 20 correct?

21 A. What do you mean by a "profile" of the channel?

22 Q. The shape of the channel. In other words -- in  
23 fact, let me back up a little.

24 I believe that you stated that you assumed,  
38:33 25 for purposes of your study, that the Gila was, in fact, a

1 single channel under predevelopment conditions?

2 A. I assumed that, and then I tested that assumption  
3 with four different tests, yes.

4 Q. And then the conclusion -- you made that  
19:38:47 5 assumption, but then the conclusion of your report also  
6 was that the Gila was a single-channel stream, a  
7 meandering single-channel stream. Isn't that correct?

8 A. Yes. Now it's not fully fair to say that I made  
9 this assumption la-de-dah. I have a lot of experience. I  
19:39:06 10 knew the slope of the channel, and I knew some  
11 characteristics. And just sitting back and eyeballing it,  
12 I had a pretty good feel that it was going to be a  
13 meandering channel, so I went with that and then checked  
14 it.

19:39:19 15 Q. So your study -- or I should say, perhaps, your  
16 model, is that a better terminology?

17 A. Well, or method.

18 Q. Method. Your method required you to make some  
19 kind of an assumption as to the nature of the channel, and  
19:39:33 20 by "nature," I mean whether it was a single meandering  
21 channel or the braided-type of morphology that we have  
22 been talking about earlier today. Is that correct?

23 A. It was initially assumed and then verified. And  
24 when the verification showed that that's what that channel  
39:48 25 wanted to be in its natural state with variation as we

1 discussed, but that's what it wants to be. And that  
2 finalized it.

3 Q. But nevertheless, your methodology assumed a  
4 single channel, not a braided channel. And then the  
19:40:04 5 outcome of your methodology also concluded that it was a  
6 single-channel meandering stream?

7 A. Yes.

8 MS. COPELAND: I have no further questions.

9 CHAIRMAN EISENHOWER: Thank you.

19:40:14 10 Anybody else have some questions?

11 (Mr. Hjalmarson is answering questions.)

12 BY MR. SPARKS:

13 Q. I'm Joe Sparks. A little weary, are you?

14 A. No, I'm doing good. I've got a cup of cocoa  
19:40:39 15 waiting for me at home.

16 Q. There you go. That's in Verde Valley where you  
17 live?

18 A. Yes.

19 Q. What was that ditch you showed there?

19:40:43 20 A. I'm the Verde Ditch, I have 1867 water use  
21 rights. Verde Ditch is one of the oldest -- well, and  
22 then it was pre-fort ditch that went through the property,  
23 and I live on the old fort farmland.

24 Q. So the old -- the lower ditch -- the old Verde  
41:01 25 Ditch?

1 A. Yeah, I'm the upper one now, but there was the  
2 old lower one. So you know the area.

3 Q. Oh, yeah.

4 Do you have any land that has ever been  
19:41:08 5 flooded by that property -- river since you have been  
6 there?

7 A. That would be embarrassing. I was a flood  
8 specialist. I worked a lot with FEMA when FEMA was  
9 formed, and if I got flooded, I'd probably have to move to  
19:41:22 10 someplace.

11 Q. I'm not talking about you getting your feet wet,  
12 I was just talking about whether any part of your land  
13 ever got flooded.

14 A. I'm right on the edge of the -- I'm just outside  
19:41:31 15 the hundred-year floodplain, but there's silt and sand  
16 there and it's obviously deposited by the river.

17 Q. Another interesting side note was I heard you say  
18 something about the base discharge from the Big Chino, at  
19 what, .3 CFS, plus or minus two?

19:41:49 20 A. Plus or minus a couple, yeah. During the drought  
21 here, it went down to about 19.

22 Q. I just wanted to understand some things about  
23 your study which I haven't had a chance to study myself.  
24 But my understanding of what you did in working with the  
42:12 25 1870 -- the 1870 to 1670 (sic) period was you're trying to

1 look at things before major diversions occurred and  
2 depleted the flows of the river. And I know that, looking  
3 at your curriculum vitae, that most of your work has been  
4 done in flood flows, correct? And most of the published  
19:42:35 5 work that you have done is flood flow published --

6 A. A lot of the published stuff is. I served two  
7 years with the National Academy of Science on alluvial fan  
8 flooding situation and that included alluvial processes  
9 and -- which apply to this and -- but, yes, generally  
19:42:53 10 speaking, I have done a lot work with them.

11 Q. And when you worked with the Corps of Engineers,  
12 you went to --

13 A. No, USGS.

14 Q. But didn't you go to some Corps of Engineers  
19:43:04 15 studies and seminars on navigability?

16 A. No.

17 Q. No?

18 Is this the only navigability study that  
19 you've done?

19:43:14 20 A. Yes.

21 Q. I was wondering, in terms of the baseline water  
22 that you used, my understanding is you took the two  
23 studies -- USGS studies, one on the Salt River Pima  
24 reservation on the Salt River, one on the Pima reservation  
43:36 25 on the Gila River, and you looked at the total amount of



1 water shown on the mean or average, the median, and the  
2 base flow and then you moved that downriver to the  
3 junction of the Gila River and the Salt and you reduced  
4 that flow by 215,000 acre-feet per year for phreatophytes  
19:44:05 5 evapotranspiration, right?

6 A. No. That was done in the groundwater modeling  
7 and that came out of the wash, so to speak -- or out the  
8 model. So the -- both reservations were modeled by the  
9 USGS. And they had an inflow amount and an outflow  
19:44:21 10 amount, and I took the outflow amounts and combined them.

11 Q. Then did you pick those two numbers up, set some  
12 numbers, and move them down to the junction of the Gila  
13 with Salt?

14 A. Yes.

19:44:34 15 Q. And you presumed that they were neither loss nor  
16 gains between those two distances?

17 A. Yes. It wasn't a significant distance.

18 And it's a complicated area too, because the  
19 groundwater from the Gila River goes over to the Salt. So  
19:44:49 20 there's budgeting and everything and kind of had a  
21 coalesce environment in a sense.

22 Q. I know more about this than I'm letting on here,  
23 but I'm just trying to make a record here.

24 A. I know, I've been listening to you guys.

45:03 25 Q. So what I'm just trying to get is the basic -- a

1 basis here for the commission.

2 And that 1760 to 1870 period, I noticed in  
3 curriculum vitae you studied the vegetative changes on  
4 watersheds and the change in production of watersheds as a  
19:45:25 5 result. You did that, didn't you?

6 A. I studied that for it's years on Sycamore Creek,  
7 and I have been involved in that as part of my career in  
8 service water hydrology.

9 Q. Have you found that the impact of grazing animals  
19:45:38 10 on the watershed changed the runoff of the watershed?

11 A. There are studies on that that have confirmed  
12 that. I believe some of them are up in Wet Beaver Creek  
13 and around, yes.

14 Q. And the nature of that change is that it causes  
19:45:50 15 the runoff to occur more rapidly. Isn't that correct?

16 A. That might depend on where you're at, and I'm not  
17 prepared to really --

18 Q. On the Gila watershed, did you take a look during  
19 the period of 1760 to -- 1670 to 17- -- excuse me, 1879 to  
19:46:15 20 1770 and take a look at what the impact of the runoff and  
21 the grazing animals would be?

22 A. No. Like I say, I reviewed the work that Thomsen  
23 and others did and was satisfied with it and went with it.

24 Q. When you mentioned that the advent of up to  
46:35 25 18,000 stock ponds, that might be a fairly conservative

1 estimate of that?

2 A. I tried to elaborate on that. Those are the  
3 filings with ADWR, and I'm sure there's a lot more stock  
4 tanks.

19:46:47 5 Q. Would you say that the 18,000 stock ponds had a  
6 substantial impact on the amount of water making it to the  
7 river?

8 A. When you look at those kind of numbers, it could  
9 be a factor, yes, because a lot of those ponds were put on  
10 strings and so forth.

11 Q. Now, I want to just go down to the methodology  
12 that you used. And you concluded, based on the two  
13 studies that your colleagues had done on the Salt River  
14 Pima and the Gila reservation, that there was 290 cubic  
15 feet per second of base flow in 1770, at least, at the  
16 junction in the Gila River.

17 A. Hold on. There's a third colleague now. There's  
18 Anderson and Freethey. Freethey and Anderson did the base  
19 flow report.

19:47:41 20 Q. But they didn't -- did they do a base flow  
21 estimation for the Gila below the junction of the Salt?

22 A. Yes. They did a base flow analysis for all of  
23 the alluvial basins and the basin and range physiographic  
24 province in Arizona.

47:57 25 Q. So its base flow estimate are the number that you

1 used in your study, 290 cubic feet per second was their  
2 number for the Gila at the base -- the Gila after the Salt  
3 joins it?

4 A. Yes, sir.

19:48:15 5 Q. And that period would have been from 18- --  
6 whatever, a hundred years ending in 1870?

7 A. In their report, they didn't give a hundred-year  
8 period. Thomsen did. And I just -- they just said it was  
9 a predevelopment number, and based on their analyses of  
19:48:39 10 stability in regard to climate and so forth, I figured  
11 that what's good for the median is good for the base.

12 Q. Okay. Now the base flow is something that we  
13 could count on all the time, right?

14 A. Well --

19:48:53 15 Q. If there is no -- if there are no other  
16 diversions, the base flow is what's there in the river all  
17 the time?

18 A. Yeah. And you don't -- I have taken a simplistic  
19 definition of this. The base flow can be much greater,  
19:49:11 20 say, during early spring runoff and it can change. The  
21 base flow is there year-round and superimposed on it, so  
22 to speak, on the side of that flow duration curve is the  
23 direct runoff.

24 Q. Well, then, that wouldn't truly be the base flow  
19:49:29 25 used in simplistic -- then you really weren't dealing with

1 base flow?

2 A. Well --

3 Q. The base flow -- the base flow that I'm talking  
4 about and the one engineers typically use is the one where  
19:49:38 5 it is not adjusted at all for contributions from the  
6 surface. It simply is what yields up from the groundwater  
7 to the flow on the river at all times, right?

8 A. That would be called the flow. If you called it  
9 runoff, then using USGS, then it would be the natural --  
19:49:59 10 the natural and --

11 Q. I'm only talking about base flow.

12 A. Okay. Well, the way I used it, it is the base  
13 runoff.

14 Q. The base runoff. So it's supplemented by runoff?

19:50:09 15 A. It's the natural flow at -- 90 percent of the  
16 time, it will be that amount or more and that is a  
17 contribution from only groundwater.

18 Q. Okay. Let's get to this, then. When you took  
19 your 22 surveys of the river, which showed from which you  
19:50:30 20 derived your cross-sections, the width of the river.

21 A. 122.

22 Q. 122, I left off a hundred. Okay. You show  
23 various widths from about 153 feet to almost 300 feet in  
24 terms of the riverbed width over which you distributed  
50:52 25 that --

1 A. That's the watered.

2 Q. Over which -- let me just finish this -- over  
3 which you distributed the flow of the 290 cubic feet,  
4 correct?

19:51:04 5 A. No.

6 Q. Okay. Then when you did those cross-sections,  
7 what did you assume about the distribution of the  
8 290 cubic feet per second of base flow?

9 A. I used the relation -- the width duration  
19:51:26 10 relation I showed you, which is basically computed using  
11 kind of a flow duration relation, and that width duration  
12 relation is computed as a function of discharge, so it  
13 covers a wide range of discharge.

14 Q. Okay. So what we have here is we don't have an  
19:51:45 15 even distribution over your channel width as you  
16 calculated it for this 290 cubic feet of base flow? It  
17 isn't considered uniform across the cross-section -- your  
18 perfect cross-section of your river.

19 A. I think you're mixing hydrology and geomorphology  
19:52:09 20 and hydrology.

21 Q. I'm trying to, certainly.

22 A. Let's see. We have a width relation -- a width  
23 duration relation that can cover -- that can correspond to  
24 a discharge range of, say, a 130 or whatever on up to a  
52:41 25 few thousand.

1 Q. But I'm isolating this to the base flow.

2 A. Just to the base flow?

3 Q. Yes, sir.

4 A. Okay. Now the distribution, then, of that base  
19:52:52 5 flow across the channel would be a function of the channel  
6 characteristics and it would not be uniform.

7 Q. But you assume, in your analysis, that it is  
8 uniform, that it's a smooth curve --

9 A. Well, I assume a uniform -- or a shape that's  
19:53:09 10 described by a parabola, but then the flow characteristics  
11 across the channel, velocity and depth, of course, vary.

12 Q. And then, as you explained to the committee, when  
13 something goes around a curve, the outside bank -- the  
14 depth of water in the outside bank is going to be deeper  
19:53:27 15 and the inside of the curve, it's going to be shallower to  
16 nothing, right?

17 A. Yes.

18 Q. Okay. And then when you did your 122 surveys,  
19 none of those surveys showed the depths of the channel,  
19:53:40 20 did it -- did they?

21 A. I didn't use that. There were observations by  
22 the surveyors that have been discussed some today. 12 to  
23 15 feet, for example, in one spot. But I didn't use that  
24 information, no.

19:53:54 25 Q. And when they did that, they didn't say to the

1 depth of water or to the depth of the stream, did they?

2 A. No. No. But what they did record, rather  
3 precisely, was the width along those section lines.

4 Q. Along the section lines.

19:54:08 5 Now, there's two things that you told the  
6 committee -- the commission that you didn't tell and that  
7 was even though you had the length of the stream, the  
8 width of the stream is a cross of, let's say, north-south  
9 township line. You didn't have the degree of the river

19:54:31 10 angle, and so you calculated that using a formula that  
11 ranged from zero to 90 percent and did a distribution,  
12 right?

13 A. I assumed a uniform probability distribution.

14 Q. So that number, you didn't add that percentage.

19:54:46 15 And when you used the cross-sections, you also did not  
16 have the depth at all under any circumstance from those  
17 surveys, did you?

18 A. Not really. The ones I did have, and I threw  
19 them in the report here in Appendix C, I showed that  
19:55:06 20 they -- that is mostly just for an interest standpoint.

21 Q. Right. But for your purposes of your  
22 calculation, you didn't have that at all, you derived that  
23 number?

24 A. That's exactly right.

55:18 25 Q. And you used a numeric model to do that?



1 A. I used that equation I showed.

2 Q. I thought you used a model -- no computer model?

3 A. Well, Burkham's equation is rather complicated  
4 and it behooves the computation to use a computer program  
19:55:38 5 for that, which I have.

6 Q. So did you do a numeric model for this to derive  
7 these depths?

8 A. In a sense you could call it a model, yes. I  
9 programmed the computer and input the variables and  
19:55:54 10 computed the result.

11 Q. And so by computing the these variables, you  
12 derived them exclusively from geometry and these formulas,  
13 correct?

14 A. Yes, and the sediments.

19:56:07 15 Q. And then when you used topographical surveys to  
16 try and determine the depth and width of the stream bed,  
17 wherever you have a topo, it was at a scale that was not  
18 helpful for depth of the stream bed, was it?

19 A. You better believe it. It was a -- you used the  
19:56:26 20 term a minute ago and is a swag.

21 Q. Okay. Well, I'm not going to get into what swag  
22 means, particularly in northern California, so I'm going  
23 to try to keep right here to geology and things like that.

24 Did you, at all, do any physical  
25 cross-sections of any location at any one of your data  
56:48

1 points along the river to check, say, in paleolithic  
2 sense, the accuracy of your calculations for or your  
3 estimations for where the stream bed was and the depth of  
4 it at any one location?

19:57:11 5 A. All I did was use the surveyed sections from the  
6 GLO.

7 Q. So the answer is no?

8 A. Yes.

9 Q. Now I want to go from -- so -- and so you didn't  
19:57:28 10 use any program that I might recognize in your numeric  
11 modeling for purposes of this evaluation? Any computer  
12 model?

13 A. No. I have Minitab, which is a pretty  
14 sophisticated set of software for engineering and  
19:57:49 15 statistical computations, so if you're familiar with that,  
16 then -- I loaded it all into that.

17 Q. But that's not really a computer model for  
18 purposes of developing, it's just to do the calculations  
19 quickly?

19:58:02 20 A. It's a number cruncher.

21 Q. Okay. And the -- what is the elevation above sea  
22 level at the point where the Gila meets the Salt -- what's  
23 the elevation above sea level of the riverbed there?

24 A. I don't know. It's a few hundred feet, but I  
19:58:25 25 can't remember. I can tell you the slope of the channel.

1 Q. I heard you tell the slope, and I wondered what  
2 the elevation where it meets the Colorado was?

3 A. I forget what it was.

4 Q. Okay. Now, I want to go from the base flow to  
19:58:46 5 your median and your average flows. You're familiar with  
6 the concept of the bank storage, aren't you?

7 A. Sure.

8 Q. And you're familiar with the concept of a wetting  
9 front?

19:58:57 10 A. Yes.

11 Q. And when the base flow of a river, by  
12 precipitation, starts elevating in the riverbed, would you  
13 explain to the commission what the wetting front is?

14 A. Well, the wetting front is as the water level  
19:59:13 15 rises, the water will go into the banks and wet the banks  
16 and kind of moves as a quasi-saturated front.

17 Q. And as the level goes up, the banks take more and  
18 more water, correct?

19 A. Yes. It goes out more and more laterally.

19:59:29 20 Q. Did you do any analysis of the transmissivity or  
21 bank storage capacity of either or both banks of the Gila  
22 from -- in your study -- in the length of your study?

23 A. It wasn't necessary. Out of the scope of what I  
24 was doing.

19:59:47 25 Q. So you, in calculating the 170 cubic feet that

1 reached the Colorado River, just accepted the number in  
2 the report that -- the reports that you used previously?

3 A. I used Freethey and Anderson for that, yes.

4 Q. Okay. For purposes of the Gila Valley, basically  
20:00:17 5 everything that we see except a mountain sticking up out  
6 of it or big rocks sticking up out of it with no known  
7 foundation that we can see it's a giant alluvial fill  
8 of -- over geological time, isn't it?

9 A. Yes, and I think geologists would look at that as  
20:00:36 10 several valleys, but yes, there is a big -- well, it's  
11 part of the base and the range as you cross a province so  
12 you have these alluvial filled valleys all over the place.

13 Q. And one of the things you mentioned is that --  
14 that troubled me is that the diversion started really  
20:01:00 15 early from the Togad Indians. But I think you said  
16 something that sort of hit a nerve for me in the upper  
17 Gila Valley. You said they were -- the non-Indians were  
18 diverting water earlier than 1860 in the upper Gila  
19 Valley?

20:01:13 20 A. The diversions were starting in roughly the  
21 1860s.

22 Q. Are you aware of the Gila Decree?

23 A. Yes, I am.

24 Q. Do you know what the earliest non-Indian  
01:23 25 diversion is in that decree?

1 A. Not specifically, no.

2 Q. Okay, I will tell you it's 1872. So would there  
3 be diversions earlier than that that you're aware of?

4 A. You'll have to -- okay, are you aware of the Gila  
20:01:39 5 in the state of New Mexico?

6 Q. Certainly.

7 A. What's the earliest diversion there?

8 Q. Not that early.

9 A. Not that early? Okay. And I made a general

20:01:47 10 statement about -- I used roughly 1860. I also on Thomsen  
11 and his reports, they used 1870. I didn't quibble about

12 it, but to keep myself covered in what I'm saying here,

13 I'm using roughly 1860 because I know -- I'm on an 1867 --

14 I have an 1867 waterway. And I recognize there was an

20:02:11 15 early -- so there were diversions in the area that early.

16 Q. Not only do I know your water right, I know where  
17 you got it.

18 A. Okay.

19 Q. But that's for the Verde, not here.

20:02:23 20 A. Well, the Gila watershed -- I'm speaking -- let

21 me be general, I don't want to get too specific, but in

22 Gila watershed, I'm using roughly 1860.

23 Q. But I thought we were on the Gila from junction  
24 of the Salt down?

02:35 25 A. Yeah. But the watershed flows into it and

1 diversion anywhere in the watershed will affect what's  
2 going on in.

3 Q. So you weren't necessarily talking simply on the  
4 Gila or the Blue or the San Francisco or the San Simon?

20:02:47 5 A. No, I'm talking the watershed.

6 Q. Do you remember as a USGS guide when there used  
7 to be a gauge in the San Simon?

8 A. Yeah.

9 Q. And there isn't one now, is there?

20:02:57 10 A. You know, I retired in '93, and I quit paying  
11 attention to them.

12 Q. You're one of the wise guys, and I mean that in a  
13 complimentary sense.

14 A. I retired one week before the flood.

20:03:11 15 Q. Before what?

16 A. Before that big flood hit.

17 Q. Well, now there's no gauge there because there's  
18 nothing that comes out of it. And I think maybe your  
19 reference to the continued pumping within these basins  
20 is --

21 A. It's destroyed it, in a sense. From a surface  
22 water sense, it's destroyed it.

23 Q. Right. I guess what I had was then what you did  
24 was you didn't have any actual data, you had the estimated  
25 data of earlier works by your colleagues and those

03:43

1 estimates were based probably on regressive analysis of  
2 and referred by a number of ways including tree rings, you  
3 said?

4 A. Yes. That's what they say in the report.

20:04:05

5 Q. And in those -- in those -- and so for your  
6 purposes -- I know you said this before -- that's the  
7 entirety of the data that you used?

8 A. Those three reports were -- comprised the  
9 hydrology, and then I used an independent check that I  
10 described.

20:04:27

11 Q. Yes. Okay. Now, I guess the final question I  
12 have -- since I'm probably the only guy in here that was  
13 born and walking around at this time -- do you have an  
14 opinion as to whether the Gila River at the junction of  
15 the Salt and the Gila was navigable in 1912?

20:04:41

16 A. No -- okay, I think there was some pools and  
17 stuff in there so you might be able to go around a little  
18 pond, but no, not navigable in the context of what we're  
19 talking about.

20:05:02

20 MR. SPARKS: Okay, thank you.

21 CHAIRMAN EISENHOWER: Is there any other  
22 questions for Mr. Hjalmarson?

23 MR. HELM: Just a couple in rebuttal just to  
24 clean up the record.

20:05:14

25 MR. HJALMARSON: I thought we were friends.

1 MR. HELM: We are.

2 MR. SPARKS: The only nasty stuff, I said.

3 MR. HELM: I don't have one question about  
4 anything you said.

20:05:24 5 BY MR. HELM:

6 Q. But I do have a question. Everybody, you have  
7 been hit by about -- I think Mark and Buckeye Irrigation  
8 about the use of the word "assumption." And lawyers get  
9 all excited about using that word "assumption," right?

20:05:41 10 But I sat here and listened to what you said, and didn't  
11 you really say that you established a premise and then you  
12 verified a premise, and then when I was in school, I  
13 thought that's what they called the scientific method. Is  
14 that what you're doing?

20:05:58 15 A. Yes, sir.

16 MR. SPARKS: Yeah, but they were still using  
17 rock chisels to make marks on the wall.

18 MR. HELM: We made square wheels, but I mean  
19 it was good.

20:06:05 20 BY MR. HELM:

21 Q. What you're talking about, you were following  
22 basic scientific methodology to come up with a premise and  
23 then check it?

24 A. Yes.

06:17 25 Q. Okay. Now somebody -- and I can't remember



1 who -- asked you about have you ever heard about any boats  
2 going upstream on the Colorado and you sat here for  
3 two days -- and haven't you heard the discussion about the  
4 steamboat running up the Gila to Dome?

20:06:36 5 A. Yes, and I've actually read about it.

6 Q. So you have heard about steamboats going up the  
7 Gila?

8 A. Yes, I have.

9 Q. Okay. Do you recall from the Gila litigation --  
20:06:56 10 are phreatophytes a slow-growing plant?

11 A. No.

12 Q. Grow real fast, don't they?

13 A. They can grow. You give them water and sunshine  
14 and hold on. It's like Iowa, you can hear the corn grow.

20:07:09 15 Q. Can a phreatophyte reestablish pretty quickly?

16 A. Yes.

17 Q. I believe with the attorney from the Buckeye  
18 Irrigation District we got into non-hydraulic factors.

19 Now, there was a discussion and you indicated that one of  
20:07:36 20 them was commerce, I think. Could you just give us a list  
21 of the non-hydraulic factors that you were referring to at  
22 that spot in your report, that she was questioning you  
23 about -- just give us the whole list.

24 A. Wow. Well, it has been a while since I made the  
07:53 25 computation, but it was a lot of stuff related to the

1 conducting of business. And there's a variety of  
2 activities where you might want to ship products on a  
3 river and barges or -- it's just, in general, that type of  
4 activity. A barge with lumber or floating logs, et  
20:08:19 5 cetera.

6 MR. HELM: I don't have any other questions  
7 of this witness.

8 CHAIRMAN EISENHOWER: Are there any further  
9 questions for Mr. Hjalmarson?

20:08:31 10 Hearing none, thank you very much for  
11 participation, Mr. Hjalmarson.

12 MR. HJALMARSON: My pleasure.

13 CHAIRMAN EISENHOWER: Mr. Helm, seven years  
14 ago I got a kidney transplant. My doctor told me, "Drink  
20:08:57 15 lots of water." I brought three bottles, bought three  
16 more. I might have brought a case if I had known we were  
17 going this long, so please expedite us. And you know, I  
18 might love you, but my wife is thinking other things right  
19 now, so.

20:09:18 20 MR. SPARKS: I know his wife and you better  
21 be careful.

22 MR. HELM: This won't take very long. What  
23 I said was true, I've eliminated --

24 MS. DOYLE: Cheryl Doyle from the Arizona  
09:37 25 State Land Department. And I just wanted to know if

1 Mr. Jon Colby could go to the top of the list, if that's a  
2 possibility.

3 CHAIRMAN EISENHOWER: When does he need to  
4 leave?

20:09:45 5 MR. COLBY: About 5:00.

6 CHAIRMAN EISENHOWER: Five minutes.

7 MR. COLBY: 5 o'clock this evening is when I  
8 should have been out of here.

9 MS. DOYLE: He came here at 3 o'clock.

20:09:53 10 CHAIRMAN EISENHOWER: I think you missed  
11 your bus.

12 MS. DOYLE: It will be really short.

13 CHAIRMAN EISENHOWER: Come forward  
14 Mr. Crosby (sic).

20:10:25 15 MR. COLBY: My name is Jon Colby, and I'm  
16 not a scientist or a lawyer. I'm involved in commerce.  
17 We ship things down the river. We ship people down the  
18 river. I'm the co-owner and managing partner of Cimarron  
19 Adventures & River Company. We're a Scottsdale-based  
20:10:42 20 river rafting to your tenure operator, and we've conducted  
21 tours on the Salt and Verde and Gila rivers for 17 years.  
22 And I promised the chairman in interest of expediency I  
23 don't need to address the commerce today about the Gila.  
24 But we have done commercial tours on the Gila,  
11:00 25 specifically the section of the Gila River in what's now

1 called Gila Box National Riparian Conservation Area  
2 outside the town of Safford, just downstream of Duncan,  
3 Arizona, to just outside of Safford. And done private  
4 boating in that area as well. And have done -- I've been  
20:11:22 5 private boating on the section of Gila River downstream of  
6 Coolidge Dam in the vicinity of Winkelman, Kearney,  
7 Riverside area. We've done our tours in water as slow  
8 as -- about a 170, 180 CFS up to about 3,000 cubic feet  
9 per second. And we don't make -- haven't made heavy use  
20:11:48 10 of the Gila River at all, but we have conducted tours in  
11 that area and found it to be a pretty exceptional part of  
12 our business.

13 CHAIRMAN EISENHOWER: Any questions?

14 COMMISSION COUNSEL JENNINGS: I would  
20:12:03 15 like -- for Mr. Brashear, who is not here, he's very  
16 interested in this part of it.

17 (Mr. Colby is answering questions.)

18 BY COMMISSION COUNSEL JENNINGS:

19 Q. How long are your tours on the Gila Box and down  
20:12:14 20 from the Coolidge Dam area?

21 A. The area below Coolidge Dam, we didn't run  
22 commercially. I've done that privately in my boat just  
23 for the day. The trips in the box were two to three days.

24 Q. And I don't want to get any business secrets or  
12:29 25 anything, but one of the questions is commerce on this.

1 Can you give us some idea of what the arrangements are,  
2 for example, how much do you charge for a passenger and  
3 what services do you provide to him on that to your?

20:12:55 4 A. Our Gila Box tours cost about \$250 a day with a  
5 certain minimum number of people. We've got a minimum of  
6 four people required for the to your, and that includes  
7 transportation from the greater Phoenix area to the put in  
8 at the river. All the food and kitchen equipment, all the  
9 sanitary facilities, guides, rescue and safety equipment.

20:13:20 10 The specialized equipment that we use that meet regulatory  
11 environmental regulations that are imposed on us by the  
12 Bureau of Land Management and the transfer back from the  
13 river to the greater Phoenix area.

14 Q. So although it's a little shorter, it's very  
20:13:36 15 similar to the services provided on the Colorado River  
16 from Lees Ferry down?

17 A. Yes, sir, very similar.

18 Q. There was some other question I had.

19 COMMISSIONER HENNESS: While you're thinking  
20:14:02 20 of it, Mr. Chairman, I would like to ask a question.

21 CHAIRMAN EISENHOWER: Certainly.

22 COMMISSIONER HENNESS: Did I understand you  
23 to say that you do commercial floats below the dam or you  
24 just did it private?

14:10 25 MR. COLBY: Our company does not offer

1 commercial floats below the dam.

2 COMMISSIONER HENNESS: I figured that.

3 Thank you.

4 MR. COLBY: In fact, if I could follow up on  
20:14:18 5 that, we had the opportunity to and we chose as a business  
6 decision not to take advantage of that. At the time we  
7 made that decision, there were other companies offering  
8 that to your and for a number of reasons, we decided just  
9 not to pursue it.

20:14:31 10 COMMISSIONER HENNESS: So there are firms  
11 that you can hire to do that flow trip?

12 MR. COLBY: There have been in the past. I  
13 don't know that there are right now, but that was the  
14 case.

20:14:43 15 COMMISSIONER HENNESS: Thank you.

16 BY COMMISSION COUNSEL JENNINGS:

17 Q. Do your guides, on these trips in the Gila Box,  
18 also provide hikes to scenic areas off the river?

19 A. We do some side hikes, yes. It kind of depends  
20:15:00 20 on the needs of the group, how much time they have, and  
21 what their interests are. That does occur occasionally,  
22 yes.

23 Q. And you do camp other than along side the river?

24 A. Yes.

15:11 25 Q. Okay.

1 COMMISSIONER ECHEVERRIA: Take any fly  
2 fishing?

3 MR. COLBY: No, it's not really fantastic  
4 fly fishing in that area.

20:15:20 5 BY COMMISSION COUNSEL JENNINGS:

6 Q. Do you have to get a permit from the Bureau of  
7 Land Management or some other government agency?

8 A. Yes, the BLM permits both those sections of river  
9 that I referred to.

20:15:34 10 Q. She mentioned fly fishing, is there other types  
11 of fishing?

12 A. Yeah. I've seen catfish come out of there. I'm  
13 not a warm-water fisherman, but I know that there are  
14 catfish in the river. I've seen carp and suckers and  
20:15:51 15 there are probably dozens of fish species and I'm not an  
16 expert at addressing that, but there is fishing there.

17 Q. So it's bait fishing that you would be using if  
18 they do?

19 A. If -- yeah, if I was going to be fishing, it  
20:16:05 20 would probably be bait fishing.

21 COMMISSION COUNSEL JENNINGS: I have no  
22 other questions.

23 CHAIRMAN EISENHOWER: Okay. Thank you.  
24 How do you spell Colby?

16:17 25 MR. COLBY: C-o-l-b-y.

1 CHAIRMAN EISENHOWER: Are there any  
2 questions for Mr. Colby?

3 (Mr. Colby is answering questions.)

4 BY MR. SPARKS:

20:16:26 5 Q. I'm Joe Sparks. In this particular question --  
6 series of questions I ask -- I'm representing San Carlos  
7 Apache tribe.

8 What was the lower limits of the tours that  
9 you used for flow purposes?

20:16:41 10 A. The lowest to your that we did, I think we  
11 started on about 170 or 180 CFS at the put in, and then  
12 the San Francisco River contributed some additional flow,  
13 so it was higher than that as we got farther down.

14 Q. So would you tell the commission where you put  
20:17:01 15 in, the location?

16 A. That put in is -- I believe it's called the BLM,  
17 the old bridge picnic site. It's where the old highway  
18 that comes out of Safford to Clifton-Morenci crosses the  
19 river. It's a semideveloped access point by the BLM.

20:17:20 20 Q. And it's below the Duncan Verde Valley, right?

21 A. Excuse me?

22 Q. Below the Duncan Verde Valley?

23 A. Yes.

24 Q. Are you familiar with -- where is your take out  
17:26 25 point?



1 A. The take out is one of two, either Bonita Creek  
2 or the old Solomon Road, both of those are just upstream  
3 of the town of Safford.

4 Q. Are you familiar with the San Jose Canal  
5 diversion?

6 A. Yeah. One of our takeouts is just downstream of  
7 that, I believe. I may not be as familiar with it as I  
8 would like to think I am.

9 Q. Well, the San Jose canal diverts the entire river  
10 up to 400 cubic feet per second into the canal, so from  
11 then on, you'd be rafting in the canal. So did you do any  
12 rafting in any canals in that area?

13 A. Part of the lower section of the Gila looked like  
14 it might have been altered in some way, but I can't say we  
15 were in a canal. I mean, I wouldn't have recognized it as  
16 such.

17 Q. So it's unlikely that you rafted -- have ever  
18 rafted below the San Jose diversion, correct?

19 A. I would say that that's probably likely. The  
20 roads that we used to drive to lower put in is called the  
21 San Jose Road, but it must have been above that diversion,  
22 I would guess, yes.

23 MR. SPARKS: Thank you.

24 MS. HACHTEL: My name is Laurie Hachtel for  
25 Arizona State Land. I just have a couple of questions

1 just to clarify, Mr. Colby.

2 (Mr. Colby is answering questions.)

3 BY MS. HACHTEL:

4 Q. Can you tell me as far as -- is there one type of  
20:19:03 5 boat that you use for these tours or are there different  
6 types?

7 A. No. Because of the fluctuating flow, we have  
8 to -- pretty variable. We've done everything from 18-foot  
9 rafts down to inflatable kayaks and canoes and a  
20:19:19 10 specialized craft called a cataraft.

11 Q. And what is the maximum number of people that  
12 usually take one of these tours?

13 A. In the tours through the Box, they are pretty  
14 small; the largest group that we had there was 11 people.

20:19:30 15 Q. And can you give me some idea as far as how much  
16 weight with supplies, people, that normally are in one of  
17 these or a certain number of people, give me an average  
18 number that are usually on the tours, estimate the weight?

19 A. I would say that for a large group like that, an  
20:19:49 20 11-person trip, the boats were probably weighing -- the  
21 dunnage on the boats is probably somewhere between 800 and  
22 1200 to 1500 pounds, that's not clear of the weight of the  
23 boat.

24 Q. And what type of boat are you using for 11  
20:09 25 people?

1 A. There would be several boats, but that 11-person  
2 trip is all on rafts, 18-foot rafts, 14-foot rafts.

3 MS. HACHTEL: No further questions. Thank  
4 you.

20:20:19 5 COMMISSIONER HENNESS: Mr. Chairman, one  
6 quick question, all of these are oar trips?

7 MR. COLBY: We do a combination of oar and  
8 paddle trips.

9 COMMISSIONER HENNESS: And paddle is not  
20:20:32 10 powered?

11 MR. COLBY: No, they're not -- they are not  
12 motorized, no.

13 CHAIRMAN EISENHOWER: Seeing nobody else  
14 wanting to question, thank you very much. Thank you for  
20:20:45 15 coming. I'm sorry about the long delay.

16 Okay. Here we go.

17 (An off-the-record discussion ensued.)

18 (Dr. Littlefield is answering questions.)

19 BY MR. HELM:

20:21:18 20 Q. Dr. Littlefield, let's see if we can get through  
21 this real quickly.

22 Referring to page 109 of your report, in the  
23 middle of that page, you have a large quote and you're  
24 talking -- I believe that this quote from -- I think it's  
21:54 25 Michler supports a conclusion earlier that a guy named

1 Emory made, and you say that the Gila was not navigable by  
2 indicating only the Colorado was useful for boats. Could  
3 you give me the specific language in there that says the  
4 Colorado -- that either -- only the Colorado was used for  
20:22:15 5 boats or says that the Gila is not useful for boats? I'll  
6 take it either way.

7 A. The quotes -- excuse me, this is quoting  
8 Lieutenant Nathaniel Michler, M-i-c-h-l-e-r, who authored  
9 chapter 7 of William Emory's report. William Emory's  
20:22:37 10 report was recorded in the United States and Mexican  
11 boundary survey, which I believe was originally published  
12 in -- I believe it was the 1850s, I don't know the exact  
13 date right now. The quote says that -- this is  
14 Mr. Michler commenting on the Gila River and the Colorado.

20:23:01 15 "The Gila becomes so low that a sand-bar forms at its  
16 mouth during the summer, and at no time does it supply  
17 much water. The Colorado on the contrary, is navigable  
18 for small steamers, drawing two and two and a half feet  
19 water, as high up as Fort Yuma ..." And then he goes on  
20:23:20 20 to comment about the navigation on the Colorado.

21 Q. That doesn't say that the Gila is not navigable,  
22 does it?

23 A. Well, he says "the Colorado on the contrary," and  
24 I took that to mean that he's juxtaposing the navigability  
23:32 25 of the Colorado against something else and the only other

1 thing in his statement is the Gila.

2 Q. Talking about small steamers?

3 A. Yes. He's representing small steamers.

4 Q. You could have navigation, wouldn't you admit,  
20:23:46 5 with something less than a small steamer?

6 A. I'm only commenting on what Mr. Michler had to  
7 say in his observation at the time.

8 Q. Referring you next to page 111. And this kind of  
9 goes to the next, kind of -- I guess 112, 113, 114, and

20:24:15 10 the pictures that you've got that run through 118. You  
11 say these pictures -- I believe it is -- I'm sorry, I gave  
12 you the wrong page. It should be 113. That these

13 pictures depict the area where our famous Buckey O'Neill,  
14 I guess, was playing in the mud. Is that what you're  
20:24:45 15 meaning?

16 A. Yes, there on the Gila River between the Salt and  
17 the Colorado.

18 Q. Depending on which trips, you look at somewhere  
19 between 59 and 60 years after Buckey played in mud, aren't  
20:25:02 20 they?

21 A. Roughly.

22 Q. How do you know that they are representative of  
23 pictures of the area where Buckey played in mud?

24 A. Geographically I know where the photographs were  
25:14 25 taken based on the archival source citation.

1 Q. Okay. How do you know that that location  
2 couldn't have changed in 60 years?

3 A. It very well may have.

4 Q. So you don't know that those are fair

20:25:28 5 representations of the river at the time Buckey played in  
6 the mud at that area?

7 A. No. They only are representations of the river  
8 for the time that the caption says they are.

9 Q. Some 60 years later?

20:25:41 10 A. Yes.

11 Q. Does a river have to be reliable to be navigable?

12 A. I think that's a legal conclusion with respect to  
13 what constitutes navigability.

14 Q. Are you familiar with a Supreme Court case called  
20:26:16 15 Holt State Bank?

16 A. No, I'm not.

17 I should correct that, with the extent of  
18 Mr. Jackson's testimony earlier today, whatever he put on  
19 the screen. Other than that, I'm not familiar with it.

20:26:36 20 Q. You haven't read it or want to express any  
21 opinions, historically, about how it fits into the scheme  
22 of the jurisprudence of navigability?

23 A. No, I couldn't comment on it.

24 Q. Now, you, I guess, stated in this report the

27:00 25 opinions of this vast majority of people who viewed this

1 river at varying times over a period from about -- I think  
2 your earliest one is 1775 to 1941, maybe, somewhere in  
3 there?

4 A. Roughly.

20:27:19 5 Q. First of all, you would consider, as a historian,  
6 that to be an appropriate span of time to look at what  
7 people thought about the Gila River for purposes of  
8 determining its navigability?

9 A. Yes. And I think most of my -- the bulk of my  
20:27:37 10 sources really focus more on the middle of the 19th  
11 century up to the time of statehood, but some of the  
12 others are earlier and some are later.

13 Q. Okay. And the conclusion of all of the people,  
14 you're not saying -- and I'm trying to say this  
20:27:58 15 all-inclusively -- that what happened that was said in  
16 some letter or historical document that you used or what  
17 didn't happen, boat didn't float, for example, versus the  
18 boat floated, were opinions under -- that these people  
19 were rendering under the ordinary and natural course of  
20:28:23 20 the river?

21 A. No, their opinions of the way they perceived the  
22 river to be.

23 Q. And last, but not least, in your summary and  
24 conclusions section of your report, is it fair to  
20:28:36 25 characterize that as just a summation of everything that

1 you have said in the body of the report?

2 A. Yes.

3 MR. HELM: I have no further questions.

4 CHAIRMAN EISENHOWER: Thank you, Mr. Helm.

20:28:59 5 (Dr. Littlefield is answering questions.)

6 BY MR. SPARKS:

7 Q. Doctor, my name is Joe Sparks and for this series  
8 of questions, I'm asking them on behalf of the San Carlos  
9 Apache tribe, which is located on both sides of the Gila  
20:29:15 10 River in Eastern Arizona. Are you familiar with that  
11 reservation?

12 A. Yes.

13 Q. Probably no group of people are more sensitive to  
14 the Treaty of Guadalupe -- Hidalgo Guadalupe -- Hidalgo  
20:29:26 15 and against the treaty that my clients, because they  
16 consist of the successors from the Chiricahuas, the Gilas,  
17 the members of Apaches, the Kuyateros, the western  
18 Apaches, including the western bands and southern bands of  
19 Tonto Apaches, so there were a lot of ways for my clients  
20:29:48 20 to get in trouble once the United States and Mexico made  
21 the first Treaty of Guadalupe Hidalgo because it split --  
22 it took into United States jurisdiction, for our purposes,  
23 the land from the Center of the Gila River north, which  
24 had been previously under Spanish jurisdiction. Is that  
30:11 25 right?



1 A. Mexican jurisdiction, yes, that's correct.

2 Q. Well, I guess I went way back. Spanish, then  
3 arguably for a day France, and then Mexico, and then -- so  
4 at that time, Mexico?

20:30:27 5 A. Yes, that's correct.

6 Q. My clients could get in trouble for going to  
7 Mexico; under that treaty the United States promised to  
8 keep -- they refer to them as savages, they don't refer to  
9 themselves that way. The other savages are the savages as

20:30:47 10 far as they're concerned -- but they could get in trouble

11 for going into Mexico, which meant that if they walked  
12 past the Center line of the Gila River, they were in  
13 Mexico. And so then the Gadsden Treaty came about and the

14 other side of the Gila River down to where the Mexican  
20:31:04 15 border and the United States is now took that controversy  
16 out of play.

17 But one of the things that was interesting  
18 to me, and I think the commission would have to clarify,  
19 is the discussion about navigability of the Gila River for  
20:31:23 20 purposes of the international Treaty of Guadalupe Hidalgo.

21 Would you shed some light on the context of that concept  
22 of navigability in terms of the trade and commerce under  
23 the treaty?

24 A. Yes. I was deposed on that particular topic by  
31:46 25 Mr. Helm at my deposition on the Gillespie Dam matter.

1 And also, I believe, Dr. August talked about it as well --  
2 or was questioned about it. In my deposition, I was asked  
3 questions about whether this -- whether the Treaty of  
4 Guadalupe Hidalgo indicated that the Gila River was  
5 navigable or non-navigable. And I've since reviewed the  
6 treaty rather thoroughly, and I think a couple of things  
7 about it. One is you need to place the treaty in the  
8 historical context of events that were taking place at the  
9 time.

20:32:03  
20:32:22 10 MR. HELM: Could I interrupt, Mr. Chairman?  
11 I thought cross-examination was supposed to be about  
12 something that was either in his report or that he got  
13 asked about on direct or that they testified to. And I  
14 know I didn't ask him about the Treaty of Guadalupe  
20:32:38 15 Hidalgo. I asked the other doctor that was here, so I  
16 just think we're going to be here all night, really.

17 MR. SPARKS: First of all, this  
18 cross-examination does not follow the strict rules of  
19 evidence. It was information that was testified to. It  
20:32:59 20 may not have exactly come from this doctor, however, it  
21 was placed in play, and this is the only witness I have to  
22 straighten it out with, so I would like just to take the  
23 last moment to do that.

24 CHAIRMAN EISENHOWER: Go ahead, you may  
25 answer that question about the treaty.

1 DR. LITTLEFIELD: I'll try and keep it as  
2 brief as I can.

3 The treaty makes it very clear that the  
4 knowledge about the Gila River was very uncertain at the  
20:33:33 5 time. One of the articles of the treaty mentions that  
6 boundary is going to be going -- I believe it's separating  
7 the New Mexico territory from some other part. And it  
8 indicates that it's going to be run in a certain line.  
9 And part of the phrasing in it says "or until it reaches  
20:33:51 10 one the branches of the Gila." So there was a fair amount  
11 of uncertainty as to what was actually there.

12 I think if you look at some of the other  
13 historical documents, particularly in the 1840s, that  
14 bracket the treaty, notably the Mormon Battalion, which is  
20:34:07 15 the 1846 to 1847 where we've had ample testimony about  
16 whether the floating of the wagons indicated navigability  
17 or not. If you look at William Emory's comments -- these  
18 are all in my report, by the way, beginning at page 106  
19 and continuing on for about the next four pages. If you  
20:34:32 20 look William Emory's comments, Mr. Emory originally  
21 thought that the Gila might be navigable, and in fact,  
22 wrote a document expressly stating that. He subsequently  
23 changed his mind after serving on the Mexican boundary  
24 survey commission. And in his report to Congress stated  
20:34:53 25 explicitly that he did not believe it was navigable.

1                   When you consider those, plus several others  
2 that are in my report, and then you look at the articles  
3 dealing with the Gila River as the boundary, it's clear to  
4 me that what those articles are saying is that if it  
20:35:11 5 should be determined at some point in the future that the  
6 Gila is navigable, then both countries will cooperate in  
7 allowing their ships to go up and down it and to do the  
8 things that are necessary for navigation.

9                   But it's not saying it was navigable, it's  
20:35:27 10 just saying that if they ever determine it will be  
11 navigable or if it ever is navigable, they will cooperate  
12 jointly to that end.

13                   MR. SPARKS: Thank you.

14                   MR. HELM: I have one question I'd like to  
20:35:47 15 ask since this was a brand new topic that I didn't know he  
16 was going to testify about, if I might. Just one  
17 question.

18                   (Dr. Littlefield is answering questions.)

19 BY MR. HELM:

20:35:50 20           Q. Doctor, doesn't the fact that the Treaty of  
21 Guadalupe Hidalgo -- I know, I work on Guadalupe --  
22 mentions navigability indicate that at least to some body  
23 of people at least had some thought in the 1840s or '50s  
24 that the Gila River was navigable?

36:28 25           A. No. It indicates that they thought it might be.

1 And they wanted to cooperate in the event that there was a  
2 determination or somebody figured out a way to actually do  
3 that.

4 Q. How do you know it was a "might be" thing versus  
20:36:42 5 a maybe --

6 MR. HELM: He doesn't have to answer that  
7 question. Unless the committee would like him to.

8 MR. MCGINNIS: Is that it?

9 (Dr. Littlefield is answering questions.)

20:36:49 10 BY MR. MCGINNIS:

11 Q. Okay. I have got -- after four hours of cross  
12 I've got four areas of redirect, that means I was paying  
13 attention once an hour. So we'll be real quick.

14 First of all, there were some questions from  
20:37:03 15 Mr. Helm and his partner, or at least comments, that  
16 related to the most recent version of the report you  
17 filed. Do you recall that?

18 A. Yes.

19 Q. Can you tell me approximately what percentage of  
20:37:18 20 the information that is in the new report was in the prior  
21 report that you filed with the commission several years  
22 ago?

23 A. The raw material information was perhaps  
24 95 percent or more of the same material. I did some  
25 37:31 substantial editing to basically smooth it out and make it

1 more presentable. And with regard to the new material,  
2 there were a few places I referenced the surveyors'  
3 contract files, which is the correspondence with the  
4 surveyor, regarding what his duties were to be, which I  
20:37:51 5 had to look into after the original report. And also the  
6 photographs are -- I believe most of those are new as  
7 well.

8 Q. The second area of questioning is -- relates to I  
9 think it was this morning, it might have been a week ago  
20:38:07 10 the way this has been, but some questions you had or some  
11 things you were asked to read in the surveyor's note  
12 relating to -- and I'm paraphrasing here -- things like  
13 low banks, deep water, those kind of things, especially  
14 the deep water portion. Do you recall that this morning?

20:38:20 15 A. Yes. There were a lot of references to water in  
16 river.

17 Q. Do you have any information about whether deep  
18 water at one particular point in river or even several  
19 particular points in the river relates it to navigability?

20:38:33 20 A. No, and in fact, some of the surveyors indicated,  
21 within the same township, that there might be water in one  
22 particular location of a certain depth, and then when they  
23 surveyed a section line in a different part of the  
24 township crossing the river, they might indicate there was  
38:49 25 substantially less water or possibly even none.

1 Q. There are questions this morning relating to  
2 surveyor's notes that seem to question the accuracy of  
3 your work or whatever, on the surveyor's notes, and I have  
4 one question about that, and that is, have you ever  
20:39:08 5 undertaken a project to look at a particular set of  
6 surveyor's notes for any river and looked at those notes  
7 to determine those notes supported a finding of  
8 navigability?

9 A. Yes, I have.

20:39:20 10 Q. And how many of those rivers would you have done?

11 A. I did a study of five rivers in Idaho at the time  
12 of Idaho statehood in 1890, the Salmon River and four of  
13 its principal tributaries, and in my estimation, those  
14 rivers were commercially navigable as of the time of  
20:39:39 15 Idaho's statehood -- or navigable.

16 Q. Can you tell the commission in just a very  
17 general sense what was different about those notes from  
18 the kind of notes you saw on this project?

19 A. The notes -- other than the fact that the date of  
20:39:54 20 statehood is different, the notes were done -- as these  
21 are, over a wide period of time depending on when the  
22 surveyors were present and in different months. But as a  
23 general matter, they were virtually identical. Different  
24 surveyors of course, but they were virtually identical to  
40:11 25 these notes except that the surveyors in those cases all

1 consistently meandered all of those streams in every  
2 single township.

3 Q. The last area I have is another portion of the  
4 survey question this morning dealt with things that --  
20:40:29 5 discrepancies or anomalies in the notes or what might be  
6 considered discrepancies or anomalies in the notes; based  
7 upon your work with these survey notes and that kind of  
8 material over how many years you've been doing it, do you  
9 have any additional information about why those things  
20:40:45 10 might happen? If you don't understand my question, I'll  
11 ask it again.

12 A. No, I understand it. As I tried to indicate  
13 during my testimony and in quite a few places, I think the  
14 real problem with pulling individual cites out of field  
20:41:00 15 notes -- of for that matter, other documents -- that  
16 particularly in relation to the field notes is you're  
17 losing sight of the forest for the trees. You need look  
18 at the whole package and see if there is any kind of  
19 consistency about what the whole package is saying. And  
20:41:18 20 with regard to navigability on the Gila River, the  
21 surveyor's notes are overwhelming in their amount of  
22 evidence that they illustrate that the surveyors were not  
23 treating the river as navigable body of water.

24 MR. MCGINNIS: Thank you, Doctor.

20:41:32 25 CHAIRMAN EISENHOWER: Well, now we have come



1 the end. I want to thank the few diehards that stuck it  
2 out. And I do want to say that we are not adjourning this  
3 session, we are going into recess and we will reconvene on  
4 January the 18th here at 10 o'clock in the morning.

20:42:01

5 Because we have noticed the hearing for the Gila and the  
6 Verde, and what we're going to do on January the 18th is  
7 take up the Verde River. So that's why we're not  
8 adjourning, we are recessing until the 18th.

20:42:20

9 MR. MCGINNIS: Just a point of clarification  
10 for those of us who have to do post-hearing memos, is that  
11 evidence -- I'm assuming the evidence on the Gila River is  
12 now closed, given what you said several times.

20:42:33

13 CHAIRMAN EISENHOWER: The evidence on the  
14 Maricopa small and minor watercourses is closed, and we  
15 finished that today. And the evidence gathering on the  
16 Gila River is now closed also. That's post-hearing  
17 memorandums are now --

18 MR. HELM: Subject to post-hearing  
19 memorandums that we hang things off of.

20:42:50

20 CHAIRMAN EISENHOWER: Yes. Plus the fact  
21 that -- I assume, George, that we will have another little  
22 delay until we can get the transcript back from our court  
23 reporter. So in other words, you won't have 30 days,  
24 you'll probably have 40 days.

43:01

25 MR. HELM: What we're looking for is a

1 little adversity because we figured after we got through  
2 great contention whether I get 30 days or not. I didn't  
3 think we'd pass Thanksgiving and Christmas and New Year's  
4 in there and the Salt memorandum due too. So we were kind  
20:43:18 5 of hoping from the commission thing that you wouldn't mind  
6 if we got them in sometime in the middle of January, like  
7 the 15th or 20th?

8 MS. HACHTEL: If I may make a suggestion,  
9 for those of us who are doing post-hearing memorandums on  
20:43:35 10 each of these watercourses as they're kind of all stacked  
11 together, and especially those of us who are kind of  
12 one-man bands and don't have the ability to have other  
13 people in the office take one or help out, if the  
14 commission would consider possibly staggering the dates of  
20:43:53 15 the post-hearing memorandums to allow us to focus on one  
16 watercourse. And that way I think if you consider that it  
17 gives you an opportunity of the best information and legal  
18 arguments possible for your consideration as you go  
19 through the amount of evidence that you need to -- that  
20:44:11 20 you'll be reviewing. And that would be a benefit to those  
21 of us who are trying to get the best possible work in  
22 front of the commission based on all these things grouped  
23 together at the tail end. And I ask for commission's  
24 consideration on that.

44:25 25 CHAIRMAN EISENHOWER: Let me put it this

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25

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1 STATE OF ARIZONA )

2 COUNTY OF MARICOPA )

3 BE IT KNOWN the foregoing deposition was  
4 taken by me pursuant to stipulation of counsel; that I  
5 was then and there a Certified Court Reporter of the  
6 State of Arizona, and by virtue thereof authorized to  
7 administer an oath; that the witness before testifying  
8 was duly sworn by me to testify to the whole truth;  
9 pursuant to request, notification was provided that the  
10 deposition is available for review and signature; that  
11 the questions propounded by counsel and the answers of  
12 the witness thereto were taken down by me in shorthand  
13 and thereafter transcribed into typewriting under my  
14 direction; that the foregoing pages are a full, true,  
15 and accurate transcript of all proceedings and  
16 testimony had and adduced upon the taking of said  
17 deposition, all to the best of my skill and ability.

18 I FURTHER CERTIFY that I am in no way  
19 related to nor employed by any parties hereto nor am I  
20 in any way interested in the outcome hereof.

21 DATED at Phoenix, Arizona, this 19<sup>th</sup> day  
22 of December, 2005.

23

24

25

  
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Gerard T. Coash

Certified Court Reporter #50503